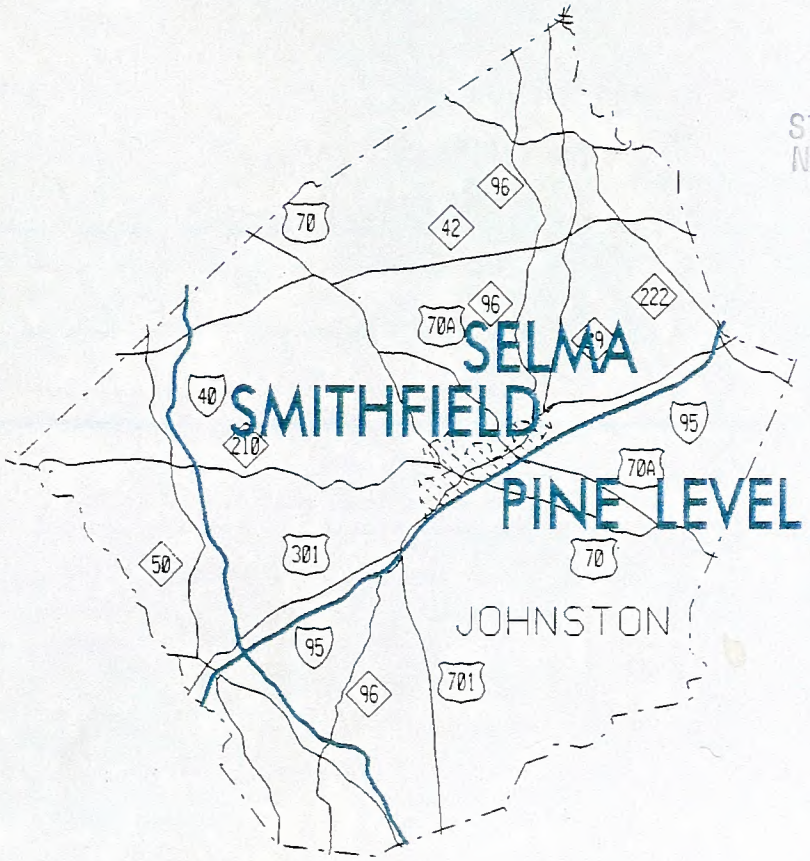
North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

Thoroughfare Plan

for



We've Got Great Connections!

June, 1993

THOROUGHFARE PLAN

FOR

SMITHFIELD, SELMA and PINE LEVEL, NORTH CAROLINA

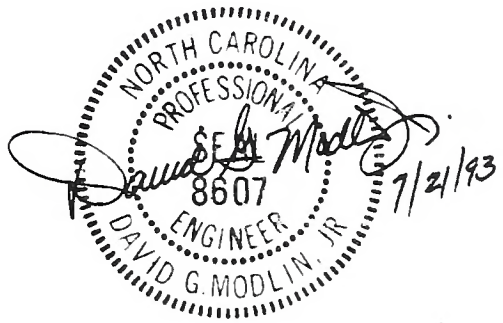
Prepared by the:

Statewide Planning Branch
Division of Highways
N. C. Department of Transportation

In Cooperation with:

The Town of Smithfield
The Town of Selma
The Town of Pine Level
The Federal Highway Administration
U. S. Department of Transportation

June, 1993



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I. INTRODUCTION

is report documents the findings of a study for the eld, Selma and Pine Level Planning Area. The study was ed in July 1990 and culminated in the mutual adoption of a hfare Plan for the Smithfield, Selma and Pine Level ng Area (Shown in Figure 8 on a map dated March 30, 1992).

The purpose of this study was to examine the present and ture transportation needs of the area, and from this derive a Thoroughfare Plan. The system of thoroughfares proposed was developed following the principles of thoroughfare planning outlined in Chapter II of this report.

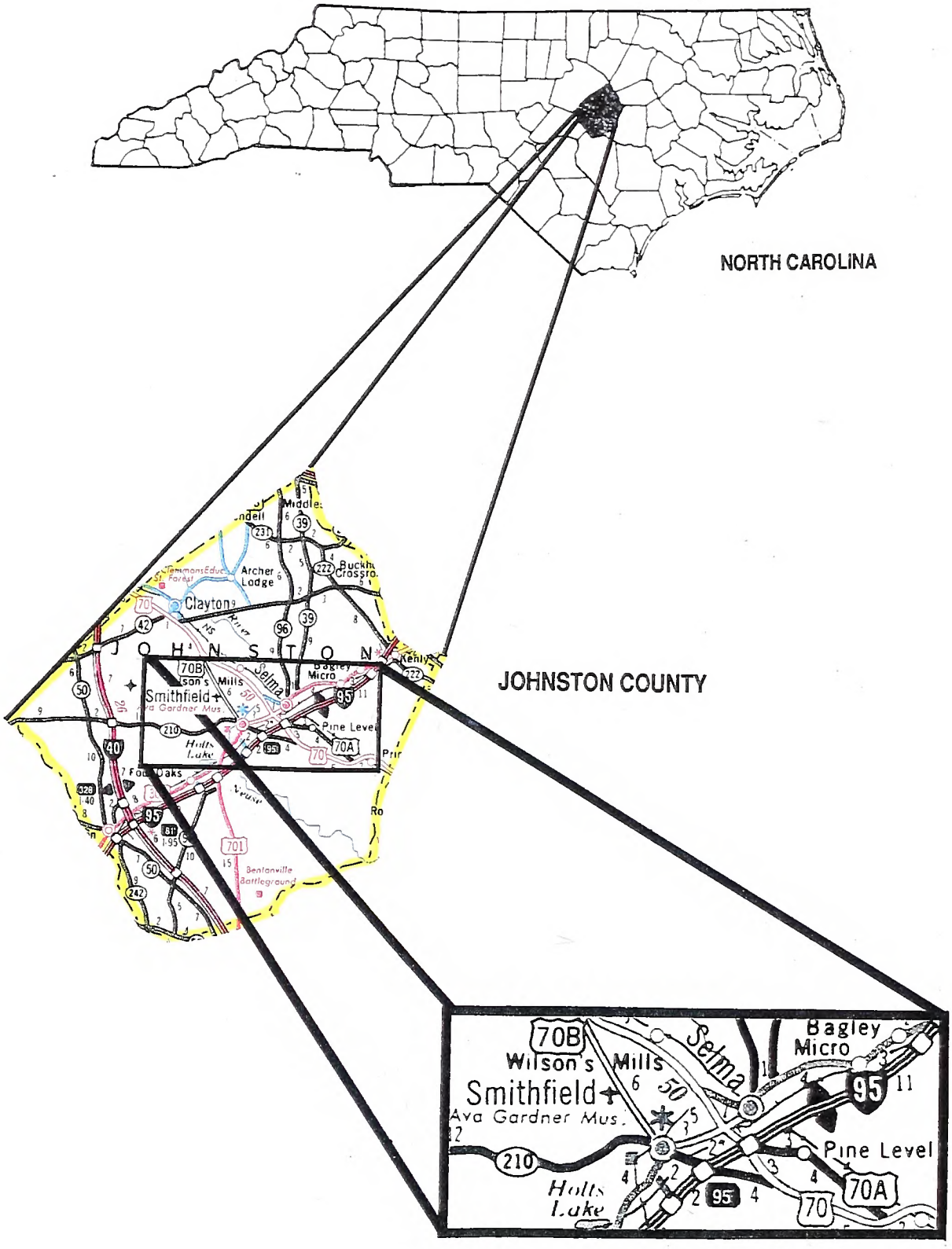
The recommended cross-sections resulting from the study are based on existing conditions and the expected volume of traffic in the design year. Before a project is implemented a more detailed evaluation will be performed to ensure that changing conditions have not altered the recommendations. Every effort was made to use as much of the existing street system as possible in order to minimize cost and environmental disruption. The location of new facilities was based on field investigation, existing land use, and topographic conditions.

Initiative for plan implementation will rest largely with the policy boards and citizens of the area. The scope of highway needs throughout the State greatly outweigh the available funding. It is, therefore, necessary that the local areas aggressively pursue funding for desired projects.

Responsibility for the proposed construction must be shared by Smithfield, Selma, Pine level and the North Carolina Division of Highways. With the different governmental agencies involved in providing the elements of the plan, coordination of activities is of prime importance. The plan is formally adopted by both the local governing bodies and the North Carolina Board of Transportation, to serve as a mutual official guide in providing a well coordinated, adequate, and economical major street system. In order for the plan to be effective, the Towns and the State must procure in advance or protect by various legal controls the rights-of-way necessary for the improvements which will ultimately be required.

It must be emphasized that the Thoroughfare Plan was based on anticipated growth of the urban area, as provided by Smithfield, Selma, and Pine Level. Actual growth rates and patterns may differ from those anticipated and it may become necessary to accelerate or retard the development of thoroughfares or to make revisions in the proposed plan. It is desirable to review the plan in detail approximately every ten years to adjust the thoroughfare system to reflect the actual rate of growth and type of development.

GEOGRAPHIC LOCATION



SMITHFIELD, SELMA, AND PINE LEVEL

FIGURE 1

II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. providing for the orderly development of an adequate major street system as land development occurs,

2. reducing travel and transportation costs,

3. reducing the cost of major street improvements to the public through the coordination of the street system with private action,

4. enabling private interests to plan their actions, improvements, and development with full knowledge of public intent,

5. minimizing disruption and displacement of people and businesses through long range advance planning for major street improvements,

6. reducing environmental impacts, such as air pollution, resulting from transportation, and

7. increasing travel safety.

Thoroughfare planning objectives are achieved through (1) improving the **operational efficiency** of thoroughfares; and (2) improving the **system efficiency** through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined as the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include **street widening, intersections improvements, improving vertical and horizontal alignment**, and **eliminating roadside obstacles**. For example, widening of a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. Impedances to traffic flow caused by slow moving or turning vehicles and adverse effects of horizontal and vertical alignments are thus reduced.

Operational ways to improve street capacity include:

1. **Control of access** - A roadway with complete control of access often carries three times the traffic handled by a non-controlled access street with identical lane widths and number of lanes.

2. **Parking removal** - Parking removal increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

3. **One-way operation** - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

4. **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

5. **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

1. Encourage people to form **carpools** and **vanpools** for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

2. Encourage the use of **transit** and **bicycle** modes.

3. Encourage industries, businesses, and institutions **to stagger work hours** or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.

4. Plan and encourage **land use development** or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions--traffic service and land service--which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow, side friction, and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, or major thoroughfares (see Figure 2).

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets could be served. Local streets may be further classified as either **residential, commercial, and/or industrial** depending upon the type of land use which the serve.

Minor Thoroughfares are more important streets on the city system. They collect traffic from local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor

through traffic movements. A third function that may be performed is that of providing access to abutting property. Minor thoroughfares should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property; however, **their major function is to carry traffic.** They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic; each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfare forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several functional elements--radial streets, crosstown streets, loop system streets, and bypasses (see Figure 2).

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities and the economic strength of the central business district depends upon the ability of this type of thoroughfare to move traffic.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **crosstown streets** which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between outlying areas. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. loop streets do not necessarily carry heavy volumes of traffic; they function to help relieve central areas.

IDEALIZED THOROUGHFARE PLAN

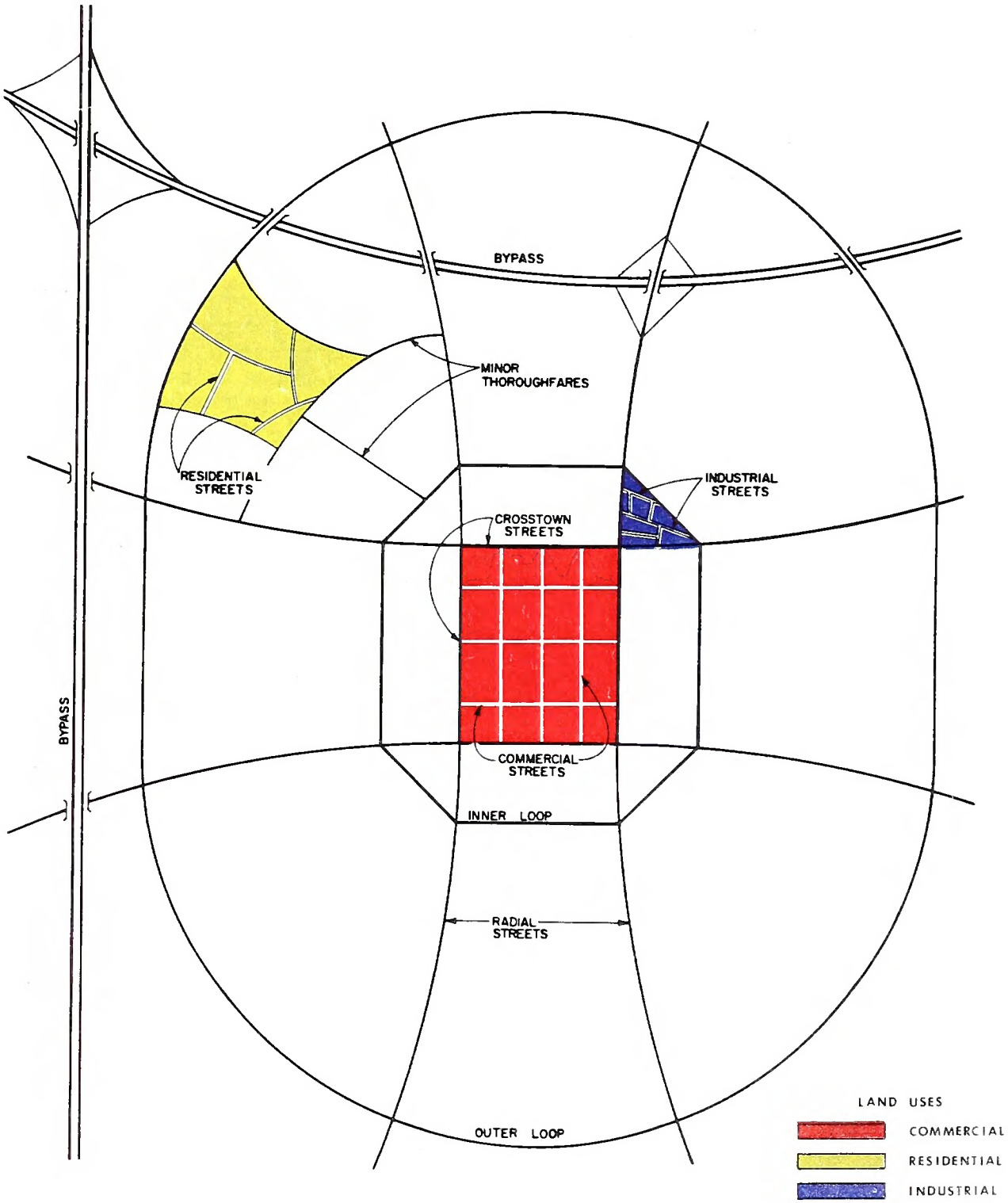


FIGURE 2

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to high-capacity standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, a thoroughfare plan is developed for established urban areas and is constrained by the existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

2. Traffic demands must be sufficient to warrant the designation and development of each major street. the thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on relatively few streets.

3. The plan should conform to and provide for the land development plan of the area.

4. Certain consideration must be given to urban development beyond the current planning period. particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect right-of-way for future thoroughfare development.

5. While being consistent with the above principals and realistic in terms of travel trends, the plan must be economically feasible.

III. EXISTING AND PROJECTED CONDITIONS

The Planning Area - Historic Background

Ten months after the signing of the Declaration of Independence, the Town of Smithfield officially came into being. However, the origins of the community date back to 1759 when John Smith, one of the area's earliest settlers, petitioned to operate a ferry where the Neuse River cuts through land he owned. The site became known as Smith's Ferry.

In 1762, Smith's son, John Smith Jr., purchased 228 acres of his father's tract, including the ferry. In 1771 construction began on Johnston County's third courthouse not far from John Smith's residence and soon the name Smith Ferry was replaced by Johnston County Courthouse. The Town of Smithfield came into being with the inaugural session of the General Assembly of the newly proclaimed State of North Carolina in 1771. Smith had agreed to provide 100 acres for the Town and an additional 50 acres for a "Commons" along the Neuse River south and east of his riverside home. The tree-shaded Commons is still preserved as a public park.

Growth did not come quickly to the Smithfield area. It's population remained around 500 until long after the Civil War. Although considered, it did not become the State Capital, so businesses which might have opened in the Town went instead to Raleigh. Railroad builders of the mid-19th century bypassed the community, further impeding growth. The development of rail transportation in Johnston County in the latter half of the 19th century gave rise to new communities and profoundly influenced economic growth.

From early in its history , agriculture has been an economic asset of Johnston County. In the antebellum period, the County was producing corn, wheat, oats, a considerable amount of cotton, and some wool. As the end of the century approached, Johnston County became known for its tobacco production. Today, nested in a grove of pines in the neighboring Town of Kenly is the Tobacco Farm Life Museum of North Carolina.

Smithfield is the largest town and also the County Seat of Johnston County. Chartered on April 23, 1777, Smithfield is located in the center of the County at the intersection of I-95 and US 70 with I-40 being only a short distance away. The economy is varied with agriculture and industry both playing heavy roles. Smithfield celebrates its agricultural heritage in April with the annual Ham & Yam Festival on the Town Commons along the banks of the Neuse River.

Two years after the Civil War ended, in 1866, a settlement four miles northeast of Smithfield, known as Mitchener's Station, became the Town of Selma, taking it's name from Selma, Alabama, which had gained notoriety as a rail center. Selma was founded as

a Railroad Hub with major North-South (CSX) and East-West (Southern) rail lines intersecting. Because of its refueling stations and repair shops, Selma became a vital rail station for both railroad companies. Since 1923 the growth that was dependent on a textile and railroad oriented economy has experienced moderate but steady increase. Contributing to this growth was the construction of Selma Oil Terminal in 1963, and the location of the Sylvania Electric Corporation plant south of Selma in 1967.

In 1873, the Town of Pine Level was chartered about 2 miles south of Selma.

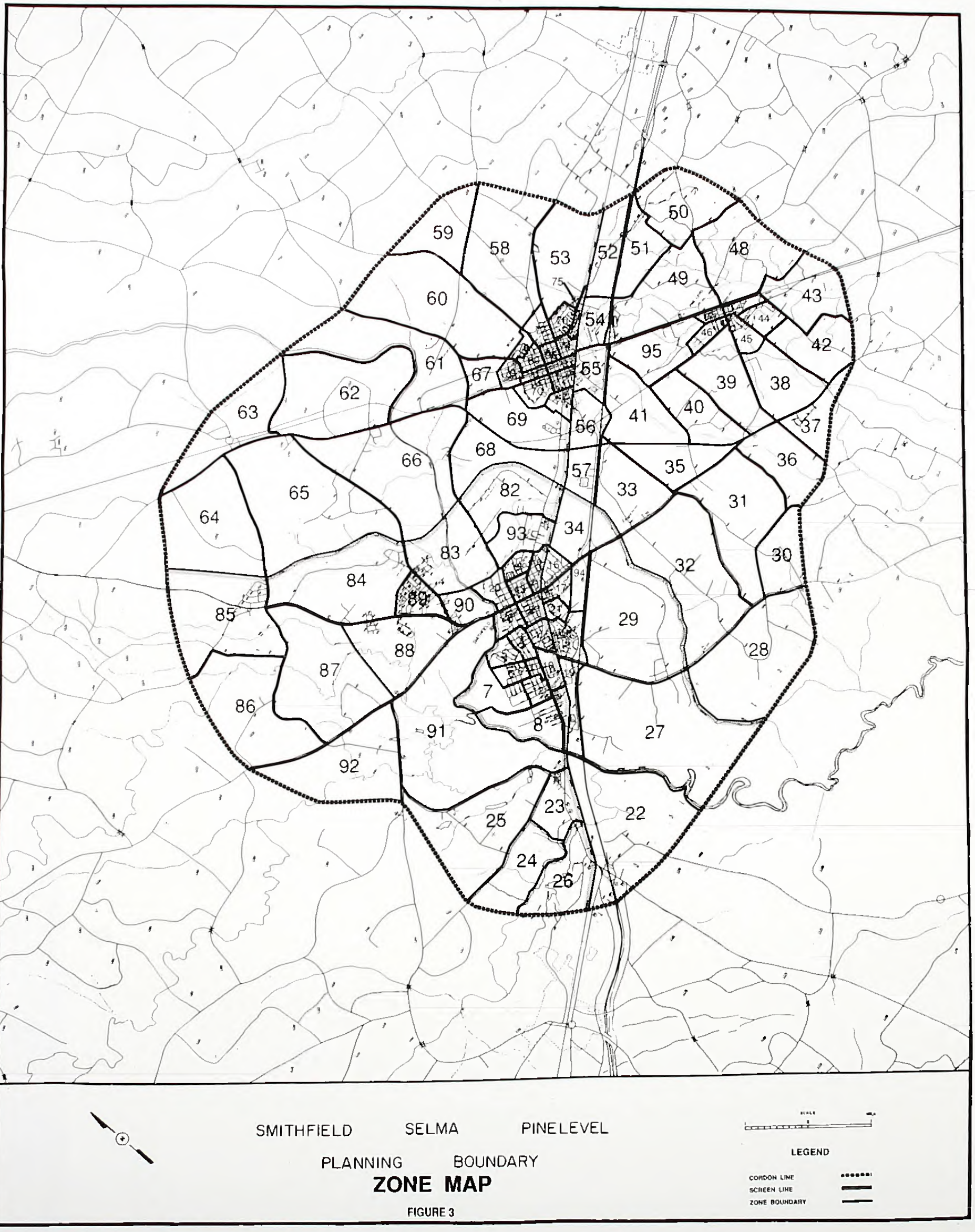
The Greater Smithfield-Selma-Pine Level Area Chamber of Commerce is a strong supporter of economic development and growth in the immediate area as well as Johnston County. One Chamber project is development of the Oak Tree Corporate Park, located in Selma. SMB-North America, a Swiss producer of metal products, is an occupant in the park.

Factors Affecting Transportation

The objective of thoroughfare planning is to develop a system of streets and highways which will enable people and goods to travel safely and economically. To determine the needs of a planning area, the factors of population, land use, and traffic must be examined. To properly plan for the transportation needs of the Smithfield, Selma and Pine Level Planning Area, it is important to understand and describe the type and volume of travel which takes place in that area, and also to clearly identify the goals and objectives to be met by the transportation plan.

In order to fulfill the objectives of an adequate thirty year thoroughfare plan, reliable forecasts of future travel patterns must be achieved. Such forecasts are possible only when the following major items are carefully analyzed: (1) historic and potential population changes; (2) significant trends in the economy; and (3) character and intensity of land development. Additional items that vary in influence include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the area.

The first step in the development of the thoroughfare plan is to define the planning period and the planning area. The planning period is typically on the order of 20 years. The base year for the Smithfield-Selma-Pine Level study was 1990, and the year 2020 was chosen to be the endpoint of the study period (30 years). The planning area is generally the limits to which some urbanization is expected to occur during the planning period. Due to extreme interdependence of Smithfield, Selma and Pine Level, the planning area includes the rural areas between them. The planning area is then subdivided into traffic analysis zones. Figure 3 shows the planning area boundary and zones.



SMITHFIELD SELMA PINELEVEL

PLANNING BOUNDARY

ZONE MAP

FIGURE 3

LEGEND

CORDON LINE

SCREEN LINE

ZONE BOUNDARY

Population

Travel is directly related to population. The volume of traffic on any given section of roadway is closely related to the size and distribution of the population which it serves. Because of this relationship, one of the basic steps in planning a transportation system is an in-depth population study. The most important population estimate for development of the thoroughfare plan is that of the planning area. Even though government census data is not available for the transportation planning area, data such as number of dwelling units in the planning area and persons per household can be used to estimate the population of the planning area.

The 1990 housing survey for this transportation planning area gave a final count of 9,244 units. The population for this area was calculated based on overall statistical trends of estimated persons per household. Therefore, the most accurate population count for this planning area multiplies the housing count times the number of persons per household estimated for Smithfield, Selma and Pine Level.

In 1990 the persons per household ratio in Johnston County was 2.60. Smithfield had a persons per household ratio of 2.30; Selma, 2.31; and Pine Level, 2.18. For the planning area, 2.5 persons per household was calculated based on the 1990 census data. Using a calculated 2.5 persons per dwelling unit for the Smithfield, Selma and Pine Level transportation planning area, a population of 23,110 was estimated for the year 1990.

To project the planning area population to the design year a population growth rate of 1.1% per year was calculated based on the population projections for the Johnston County by the State Budget Management Office. This growth rate was then applied to the present transportation planning area population to estimate a populations of 28,718 and 32,328 persons in the years 2010 and 2020 respectively. To convert this figure back to future housing, a 2.35 and 2.30 persons per dwelling unit ratio is used for 2010 and 2020 respectively.

TABLE 1

Population Projections for the Planning Area

Year	Smithfield Township	Selma Township	Pine Level Township	Johnston County	Planning Area
1960	11,142	6,245	2,317	62,936	
1970	11,975	6,601	2,460	61,737	
1980	12,491	7,310	2,750	70,599	
1990	12,974	8,065	2,926	81,306	23,110
2010	15,900	10,200	3,650	103,173	28,718
2020	17,990	11,000	3,940	113,032	32,328

POPULATION TRENDS FOR THE SMITHFIELD–SELMA–PINE LEVEL AREA

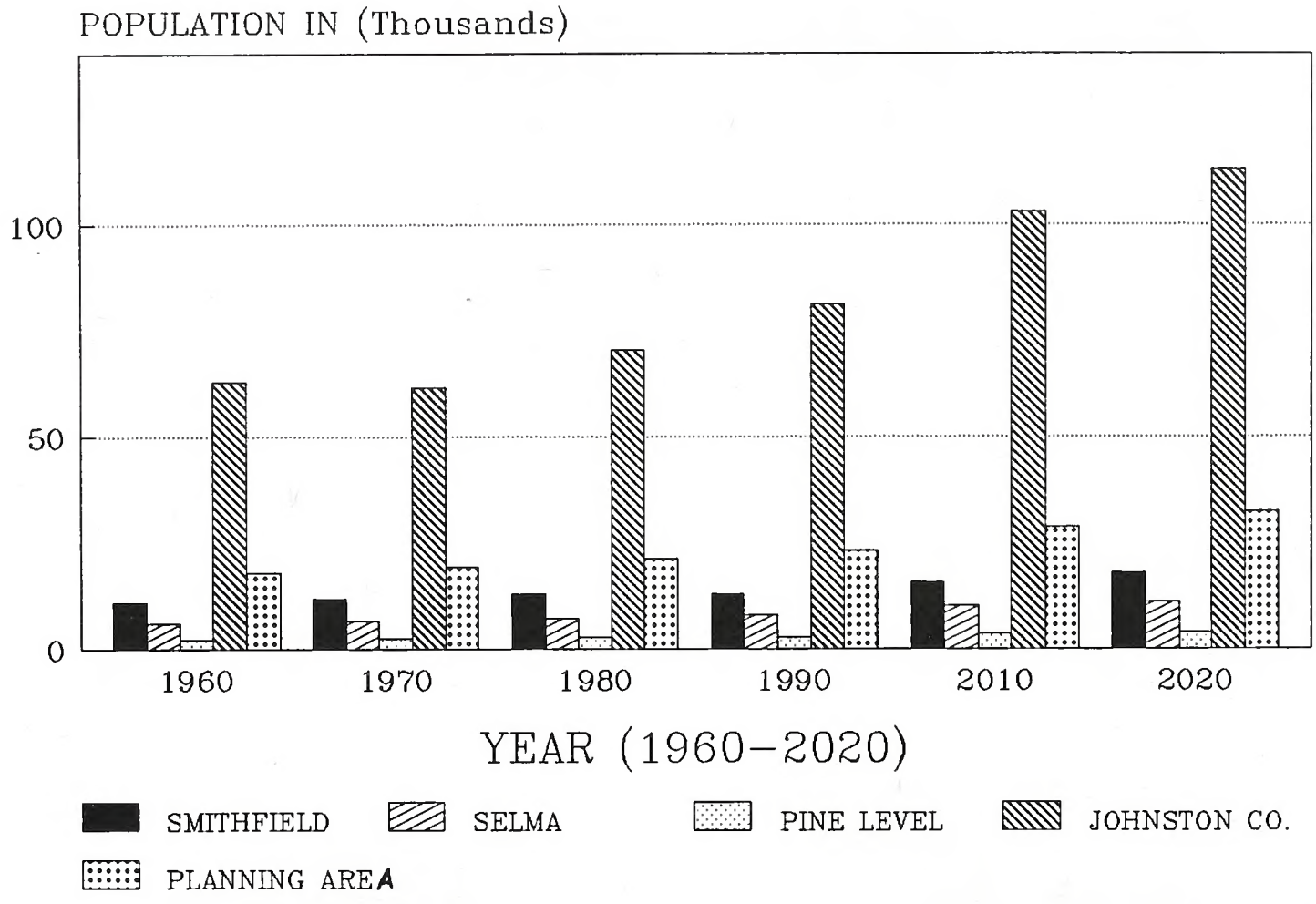


FIGURE 4

Economy and Employment

One of the more important factors to be considered in estimating the future traffic growth of an area is its economic base. The number of employees and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicle trips generated per day by each household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Employment figures for Smithfield, Selma and Pine Level show that in 1990 there were 12,386 jobs in the planning area. The employment to population ratio was determined to be 0.54. Employment projections made with this ratio and future population estimates indicate a potential 16,360 jobs in the year 2020. Similarly, 15,430 jobs were calculated to be available in the year 2010.

A comparison by percentage of five major job types available in the planning area from 1990, 2010 and 2020 shows no significant shift. However, there is a slight increase in industrial and special retail jobs and a corresponding decline in retail, office and service related jobs.

TABLE 2

Percentages of Job Types Available for Planning Area

Job Type	1990	2010	2020
Industry	30.8%	31.6%	31.9%
Retail	18.6%	18.4%	18.2%
Special Retail	8.1%	8.3%	8.6%
Office	20.0%	19.7%	19.5%
Service	22.5%	22.0%	21.8%

Land Use

The generation of traffic on a particular street is very closely related to the utilization of the adjacent land areas. Some types of land uses generate more traffic than do others. For example, a shopping center generates much larger volumes of traffic than do residential areas. The attraction between different land uses varies with the intensity and spatial separation of the uses.

For use in thoroughfare planning, land uses are grouped into

four categories: (1) Residential - all land devoted to the housing of people with the exception of hotels and motels; (2) Commercial - all land devoted to retail trade including consumer and business services and office; (3) Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products; and (4) Public - all land devoted to social, religious, educational, cultural, and political activities. Figure 5 shows the existing planning area's land use.

Anticipated future land use is a logical extension of the present spatial distribution. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares. Areas of anticipated development and growth for Smithfield, Selma and Pine Level are:

Residential

Smithfield - A large amount of Smithfield residential land development is on the north and west of the Town. Within the town limits, the western section of Smithfield has some potential for new development. The location with the most potential for residential development is outside of the town limits between Selma and Smithfield.

Selma - Future residential development in the Selma area is expected to occur outside of the Town because according to the Selma Land Use Survey and Development Plan, most of the soil within Selma is characterized as having severe limitations for dwellings.

Pine Level - Future residential development in the Pine Level area is expected to occur on the east side of the Town.

Commercial/Retail

Smithfield - The majority of commercial development in Smithfield is in three areas. The central business district along Market Street (US 70 Business), which is primarily offices and retail stores, along US 301, and along I-95. Smithfield is one of the major shopping areas for the towns and communities in the planning area. Currently commercial development along US 301 and US 70 Business is causing traffic problems. Additional driveway entrance permits along these routes should be carefully analyzed. There should be increased emphasis placed on the need to plan these areas in order to eliminate congestion and traffic hazard.

Selma - The majority of the commercial development in Selma is located along US 301 (Pollack Street), I-95 and downtown Selma.

Pine Level - The commercial development in Pine Level is in downtown area with some additional along US 70-A.

LAND USE

FIGURE 5

RESIDENTIAL

PUBLIC

COMMERCIAL

INDUSTRIAL

SMITHFIELD
SELMA
PINE LEVEL
AND VICINITY
JOHNSTON COUNTY
NORTH CAROLINA

Industrial

Smithfield - Most of the manufacturing plants in Smithfield are located between I-95 and US 301 on both sides of the Seaboard Coast Line Railroad. Channel Master, Burlington House, and Johnston County Industries are the leading industrial employers in the Smithfield area. Agricultural industry plays an important role for the area economy. An industry typical of a tobacco growing region is tobacco processing. Among its leaders is Smithfield's K. R. Edwards Leaf Tobacco Company. Smithfield has six operating tobacco warehouses on the North Carolina Tobacco Market. Also light industries which consist of light processing and assembly operations, building material yards, machinery yards, nurseries, warehouses, and salvage yards are dispersed throughout the Town.

Selma - Selma has a significant number of industrial establishments, several of which are located along Preston Street east of the Seaboard Coast Line Railroad in an area designated for industrial development. Eaton Corporation produces electric switches. Johnston Mills, a long time resident of the area, produces yarns. Novo Nordisk, a Danish pharmaceutical company, commenced production in 1992 and produces insulin. The Griggs Equipment Company is located along the Southern Railway on Anderson Street. Major oil storage facilities are located along SR 1003 and SR 1929. Other industrial and warehouse facilities are scattered throughout Selma. Future industrial development sites are all adjacent to either the Southern Railway or the Seaboard Coast Line Railroads.

Pine Level - Dixie Belle Textiles and Morganite Assemblies are Pine Level's largest industrial employers.

Public

The Planning Area has a number of parks and institutions for public use. Some facilities available for recreational use are Bingham Park, Talton Park, Smith Collins Park, Broadwell Park, Burlington Park and the Town Commons in Smithfield and the Richard B. Harrison Recreation Center and Athletic Complex in Selma. Educational institutions such as Johnston County Technical College and Smithfield-Selma Senior High School are located in Smithfield.

IV. TRAVEL FORECAST MODELS

While traffic volume counts on existing streets are useful in evaluating the ability of the current system to meet travel demands, they reveal little as to the actual travel desires (origins and destinations) of the motorist. For thoroughfare planning purposes, a comprehensive knowledge of the origins and destinations of existing traffic and estimated future traffic is essential.

The type, intensity, and location of the population and employment within an area largely determine the travel patterns. The method used to predict future travel involves the development of mathematical models relating population and employment to travel. Models are developed to (1) estimate trips produced (origins) and trips attracted (destinations) by traffic zones and (2) to estimate travel patterns between zones. Separate models are developed for the three basic types of tripes: internal, internal-external, and through. **Internal trips** are defined as those trips which have both origin and destination inside the planning area. An **internal-external trip** is a trip which has one end inside the planning area and the other outside. **Through trips** are defined as those trips which travel through the area and have both origin and destination outside the study area.

The travel forecast models for the Smithfield, Selma and Pine Level area were developed on the basis of travel, employment and population data obtained for the base year 1990. The validity of the models was tested by comparing the traffic volumes computed by the models to traffic volume counts taken on the existing street system.

After travel forecast models have been calibrated so that they adequately duplicate travel, design year travel estimates are produced through the input of design year data on population and employment. The trip distribution models are sensitive to changes in the street system and variation will occur in the travel patterns as alternative future street plans are tested. A more detailed documentation of the travel forecast models is given in Appendix A. Table 3 gives a summary of travel data trends for the area.

TABLE 3

TRAVEL DATA SUMMARY		
Type	1990	2020
Average Daily Trips per DU	7.07	7.78
Internal Trips	56,218	94,296
Home Based Work	14,055	23,574
Other Home Based	29,796	49,977
Non-Home Based, internal	12,368	20,754
NHB secondary	24,476	48,980
Internal <-> External	63,972	120,752
Through Trips	77,044	158,872

Average Daily Trip/DU = the number of internal personal auto trips divided by total DU

V. ANALYSIS OF THE EXISTING STREET SYSTEM

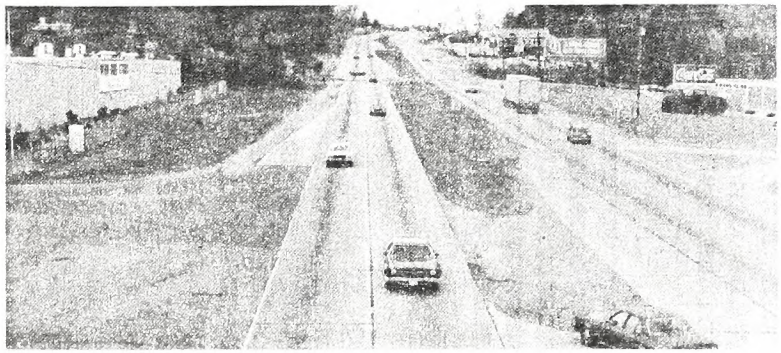
This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Travel Patterns

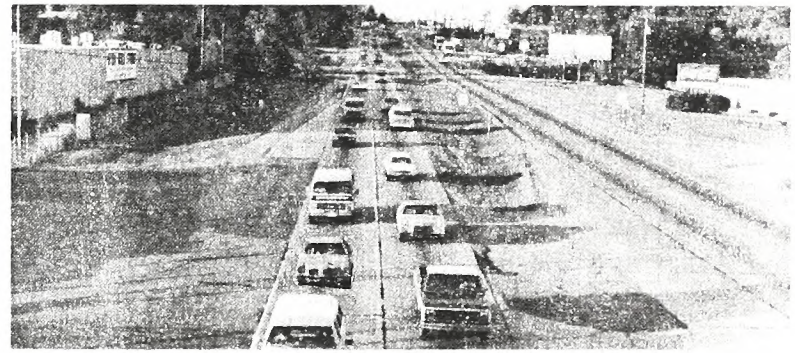
A relatively good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the street to move traffic, its **capacity**. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the width of the pavement, and the traffic control devices utilized. Thus the ability of a street to move traffic can be increased to some degree by restricting parking and turning movements, using proper sign and signal devices, and by application of other traffic engineering techniques. According to 1985 Highway Capacity Manual, capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given time period under prevailing roadway and traffic conditions. The relationship of traffic volumes to the capacity of the roadway will determine the level of service being provided. Six levels of service (LOS) are used (Figure 4) to identify the conditions existing under various speed and volume conditions on any Highway or street. The six levels of services are:

1. Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

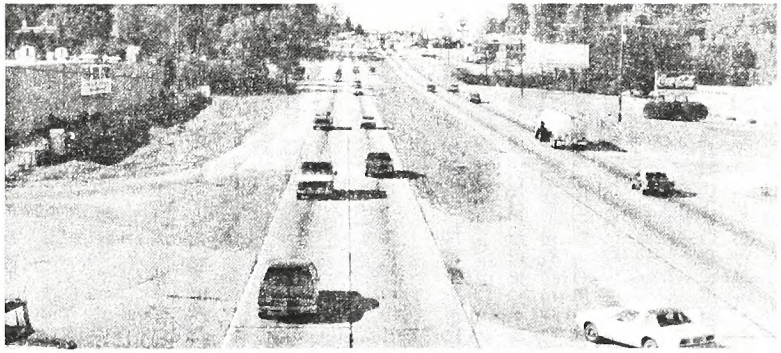
2. Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from level-of-service A.



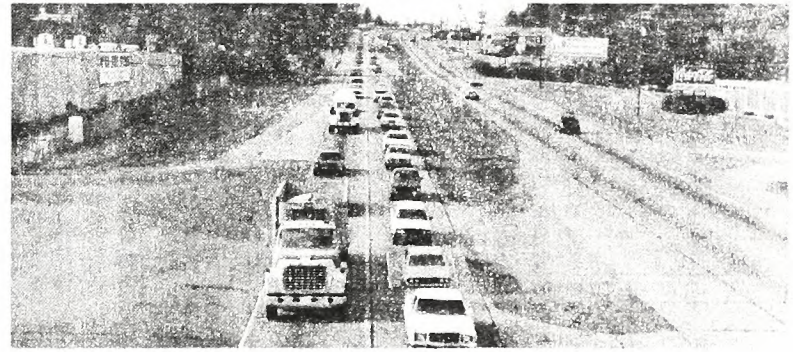
LEVEL OF SERVICE - A



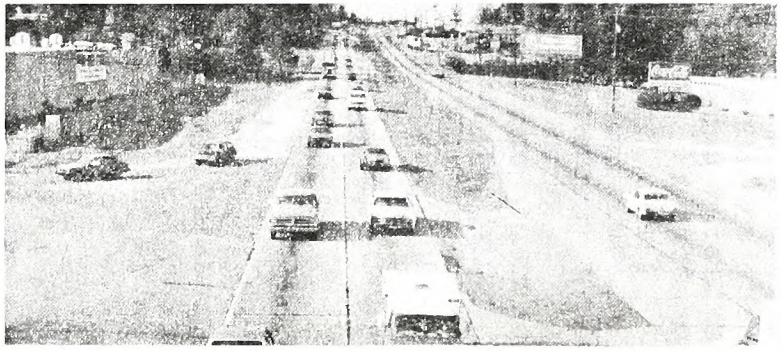
LEVEL OF SERVICE - D



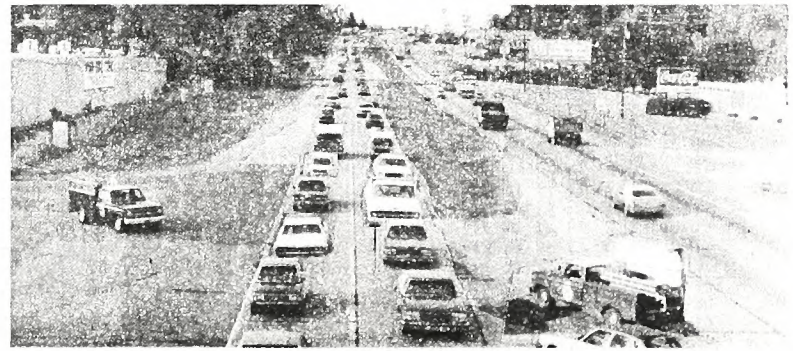
LEVEL OF SERVICE - B



LEVEL OF SERVICE - E



LEVEL OF SERVICE - C



LEVEL OF SERVICE - F

LEVELS OF SERVICE

3. Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic steam will cause breakdowns. Maneuvering within the traffic stream requires substantial caution on the part of the user. The general level of comfort and convenience declines noticeably at this level.

4. Level-of-service D represents high-density, but stable flow. Speed and freedom to maneuver are severely restricted. The driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

5. Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Maneuver within the traffic stream is extremely difficult, an it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers.

6. Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues from behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. In many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. It is the point at which arrival flow exceeds discharge flow which causes the queue to form. Level-of-service F is an appropriate designation for such points.

Capacity Deficiencies

The purpose of calculating capacities of the major links of the street network was to know how well the network could serve existing and design year (2020) traffic. In 1990 capacity analysis reveals that US 70 Business from US 301 to US 70 Bypass is over capacity and two sections of US 301, from SR 1345 to SR 1007 and from SR 1927 (Anderson Street) to the Selma Town Limit are approaching capacity. For design year capacity analysis, the 2020 travel desires were generated from the calibrated model and

were assigned to the existing major street system. Deficient corridors created by the 2020 traffic demand assigned to the existing network were then observed (See Figure 7).

System Deficiencies

System deficiencies are a measure of the extent to which the existing system lacks continuous radials, loops, crosstowns, and bypasses. The following system deficiencies were identified for the Smithfield, Selma and Pine Level Planning Area.

1) Lack of a loop facility to facilitate through trip movements and lateral movements in the outlying areas.

2) Lack of an adequate bypass facility for east-west travel. This deficiency has already been recognized and the 1992-1999 Transportation Improvement Program provides for a US 70 Smithfield Bypass (R-84). Figure E-1 in Appendix E shows a project breakdown map of US 70 Smithfield Bypass.

3) Offset intersection of US 301 and Canterbury Road and Peeden Road in Smithfield. This is a "dog-leg" intersection with a 130-foot offset from the centerline of Canterbury Road to the centerline of the Peeden Road. Conflicting left turns on Canterbury Road and Peeden Road impede flow of traffic on US 301.

4) Offset intersection of North Street and Third Street and Buffaloe Road in Smithfield. This is a "dog-leg" intersection with a 150-foot offset from the centerline of the Third Street to the centerline of the Buffaloe Road. Conflicting left turns on North Street during peak hours, impede flow of the traffic through this intersection.

5) Offset intersection of SR 1001 (Lizzie Mill Road) and SR 2137 (Pittman Road) and SR 2309 (Peedin Avenue) near Pine Level.

6) Offset Intersection of Berkshire Road and Hospital Road in Smithfield.

Special Corridors

National Truck Network routes, as designated by the U.S. Secretary of Transportation for STAA (Surface Transportation Assistance Act) vehicles, include US 70 and I-95.

Goals and Objectives

Each area has its own priorities and concerns relating to the transportation system, and related topics. In order to determine the items of importance to the planning area, a "Goals and Objectives" survey was conducted in 1990. The survey included questions about topics such as new roads, improvement to existing roads, sidewalks, traffic signals and truck routes. A space was

provided for comments at the end of the survey.

Smithfield, Selma and Pine Level officials helped in distributing the survey forms to the planning area citizens and the local newspapers encouraged the citizens to express their opinion by responding to the survey. Eighty two (82) responses were received. Appendix B includes a copy of the survey and the comments received.

Traffic Accidents

High Accident Location - Traffic accident records are of assistance in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to remedial action reducing the number of accidents.

Both the severity index and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident (Type F and A) is 64 times more severe than one involving only property damage, and an accident resulting in an injury (Type B and C) is 19.1 times more severe than one with only property damage.

Table 6 lists high accident intersections. The "Total" column indicates the total number of accidents reported within two hundred (200) feet of the intersection during the specified time period. The severity index is calculated by the Traffic Engineering Branch using the following formula:

Severity Index = {64(F+A)+19.1(B+C)+PDO} / Total Accidents

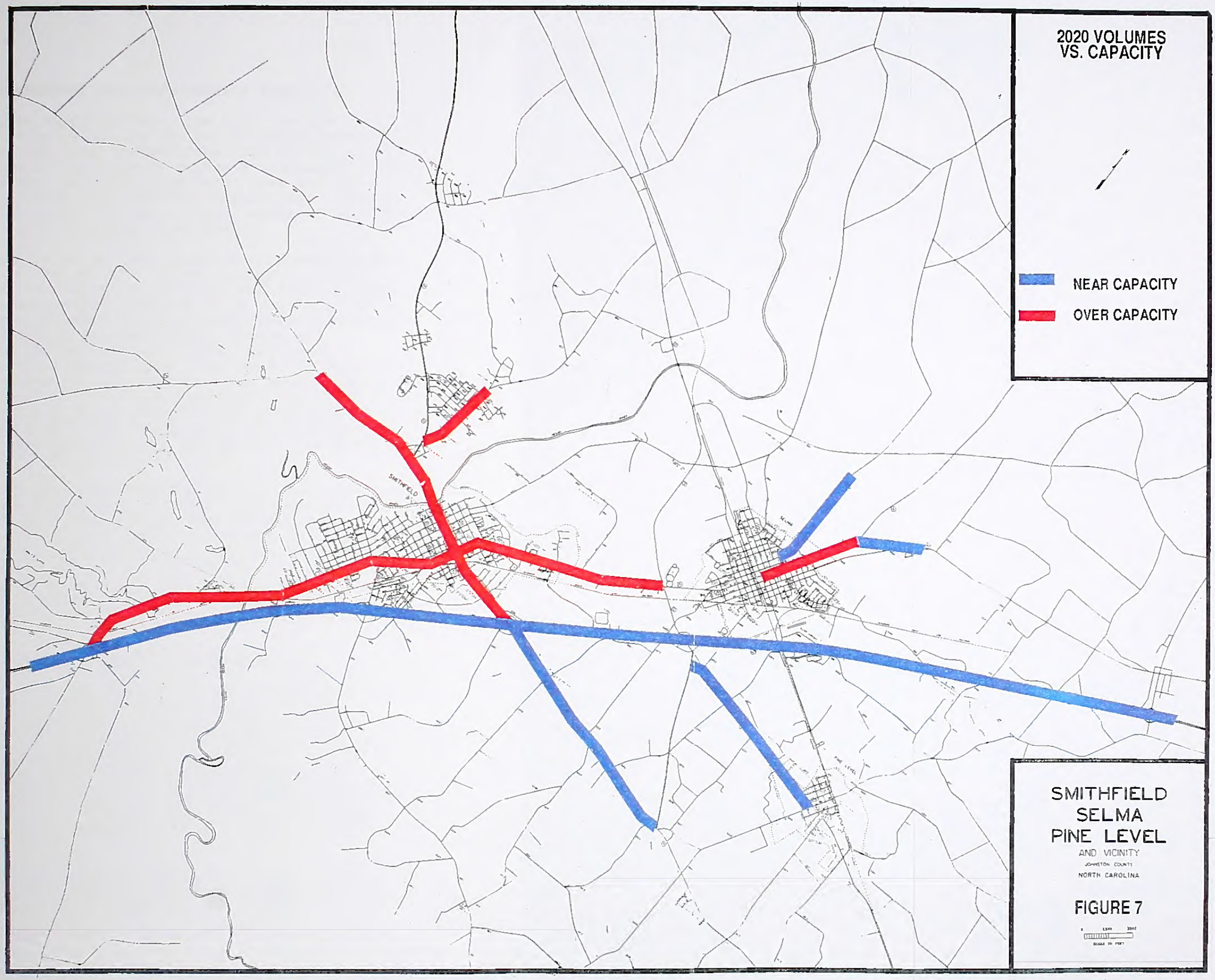
F = Fatal Accidents
A = Type A Accidents (Incapacitating)
B = Type B Accidents (Serious Injury)
C = Type C Accidents (Minor Injury)
PDO = Property Damage Only

TABLE 4

ACCIDENT SUMMARY (11/01/89 TO 10/31/92)

LOCATION	TOTAL	SEVERITY INDEX
US 70B & Second	29	7.24
I-95 & SR 1027	28	20.01
I-95 & US 301	21	10.03
US 70 & US 70B	19	18.57
Hospital & Buffalo	19	14.79
US 70B & US 301	19	6.22
US 70 & SR 1501	18	13.55
US 301 & North	18	10.05
US 70 & I-95	18	8.52
US 301 & Massey	17	8.96
US 70B & Third	17	7.90
US 70B & Front	16	6.66
US 301 & Brogden	15	7.61
US 70 & I-95	14	20.96
US 70 & SR 1913	13	10.75
US 70 & SR 2309	12	17.53
US 70B & Fourth	12	15.30
US 70 & NC 210	12	13.07
US 301 & Hospital	11	22.33
US 301 & SR 1341	11	20.68
US 301 & Bridge	11	14.95
US 70 & US 301	10	20.84
US 70 & SR 1003	10	19.97
US 70 & SR 2398	10	12.73
US 70 & Rick Road	10	10.92
SR 1010 & SR 1501	9	11.06
Buffalo & North	8	15.66
US 70B & NC 210	7	17.76
US 301 & Booker Dairy	7	15.17
US 70B & Johnston Tech	7	11.34
NC 210 & SR 1010	6	34.07
US 301 & Noble	6	20.55
Eighth & Massey	6	20.55
US 301 & Lee	6	14.52
US 70-A & I-95	6	10.05
US 70-A & Rick	5	24.46
Noble & Raeford	5	24.46
Fifth & Hancock	5	15.48
US 301 & Canterbury	5	8.24
US 301 & Booker Dairy	5	11.86

Heavy traffic volumes and lack of access control on US 70 Business and US 301 are the reasons for most of the accidents at the intersections along US 70 Business and US 301. The controlled access US 70 Bypass, which is under construction, should contribute to much safer driving conditions in the planning area.


2020 VOLUMES
VS. CAPACITY
NEAR CAPACITY
OVER CAPACITY
SMITHFIELD
SELMA
PINE LEVEL
AND VICINITY
JOHNSTON COUNTY
NORTH CAROLINA
FIGURE 7

VI. RECOMMENDED 1992 THOROUGHFARE PLAN

A thoroughfare plan study uncovers the need for new facilities, plus identifies existing and future deficiencies in the transportation system. The thoroughfare plan is a representation of the existing highway system by functional use, e.g., major thoroughfares, minor thoroughfares plus any new facilities which are needed. The planning methodology enables identification of deficiencies in the existing system, allowing the compilation of a list of needed improvements.

This chapter presents an analysis and makes recommendations based on the ability of the existing street system to serve the present and future travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The recommended plan sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for the Planning Area. The need to eliminate existing and projected system deficiencies which cause traffic congestion and safety hazard is the primary objective of the plan. US 70 Bypass, the extension of the Booker Dairy Road both to US 70 on the west and Peeden Road on the south and a US 301 Bypass to the north and west of the Planning Area are significant steps in overcoming projected system deficiencies.

The recommendations for the Thoroughfare Plan are based on the results of a traffic forecast model that uses data on traffic counts, population, housing, employment, and vehicle ownership to simulate travel (See Chapter IV). With this model each major street and highway in the Planning Area is analyzed to determine its ability to serve existing and future traffic demands. In the development of this thoroughfare plan the 1985 Smithfield-Selma Thoroughfare Plan and 1978 Selma Thoroughfare Plan were consulted. Most of the proposals from the previous thoroughfare plans were found inadequate for current conditions.

Thoroughfare Plan Recommendations

The process of developing, testing and evaluating alternate plans involved a number of considerations. These included Smithfield, Selma and Pine Level area goals and objectives, identified deficiencies (See Chapter V), environmental impacts, existing and anticipated land development, and travel services. Aerial photography, topographic mapping, wetland inventory mapping, field investigation and open discussion with local staff, officials, Chamber of Commerce and interested local citizens provided additional basis for identifying and evaluating the feasibility of the alternative alignments and their potential impacts.

A recommended Plan was developed and on April 21, 1992, a public hearing was held. Smithfield, Selma and Pine Level Town Councils endorsed the Smithfield, Selma and Pine Level

Thoroughfare Plan on May 7, 1992, and May 12, 1992, and May 5, 1992, respectively.

Figure 8 shows the mutually adopted 1992 Smithfield, Selma and Pine Level Thoroughfare Plan, map dated March 30, 1992. The major new facilities are as follows:

1) US 70 Bypass from SR 1906 west of the Planning Area to US70-A east of the Planning Area (TIP Project R-84).

2) Booker Dairy Road Extension to US 70 Business in West Smithfield.

3) Booker Dairy Road Extension to Peeden Road.

4) US 301 Bypass of the Selma and Smithfield.

5) Crestwood Church Road Extension to Booker Dairy Road.

6) West Street Extension to US 301 in Selma.

7) Jones Street Extension to Crestwood Church Road.

8) Correcting the offset intersection of North Street and Buffaloe Road and Third Street in Smithfield.

9) Correcting the offset intersection of US 301 and Canterbury Road and Peeden Road in Smithfield.

10) Correcting the offset intersection of Hospital Road and East Berkshire Road and West Berkshire Road in Smithfield.

11) Correcting the offset intersection of SR 1001 (Lizzie Mill Road) and SR 2309 and SR 2137.

The new facilities provide for continuity of travel, corridor spacing, and/or a more direct travel path. The following describes the plan in terms of its functional parts as previously discussed in Chapter II of this report. For additional supporting data on these recommendations see Appendix D.

Bypass Facility

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the local street system by removing traffic which has no desire to be in the town. Occasionally a low traffic volume bypass can be designed to function as a portion of a planning area loop. The following are the existing and recommended bypass facilities for the Planning Area:

1) I-95 serves mainly interstate and through travel. Projected design year traffic volumes for I-95 will approach capacity.

2) US 70 Bypass from SR 1906 west of the Planning Area to US70-A east of the Planning Area (TIP Project R-84). Four lane divided facility, part on new location. Total project length is 17.6 miles and is mostly constructed. 11.3 miles of R-84 is located within the Planning Area. Appendix E shows a Project Breakdown Map for R-84 in Johnston County.

3) US 301 Bypass - The proposed US 301 Bypass from US 301 near SR 2133 to US 301 south of Smithfield using SR 1914, SR 1915, NC 210, SR 1341 and part on new location

Loop System:

A loop facility is intended to handle traffic between outlying areas and act as a connector between radials. The Planning Area currently does not have such a system. The proposed US 301 Bypass will function as a loop facility for north and western sections of the Planning Area where the future growth is anticipated to be much greater than the rest of the Planning Area.

1) US 301 Bypass from US 301 near SR 2133 northwest to NC 210/SR 1010 west of the Planning Area. This proposed road will use SR 1914 and SR 1915 and connects US 301 to I-95, NC 39, NC 96, SR 1003, US 70, SR 1913, SR 1917, SR 1918, US 70B, NC 210/SR 1010, and SR 1341 to US 301 south of the Planning Area near I-95. The proposed US 301 Bypass will provide for circumferential travel movements in the northern and western sections of the Planning Area as well as providing for the expected growth and development of the Planning Area and will relieve the congestion created by the through traffic on existing US 301. Johnston County Airport will also benefit from the new facility. The proposed US 301 Bypass is recommended to be 2-lane roadway, 28 feet in width, with 12-foot shoulders (2-foot paved).

Radial Thoroughfares:

The radial thoroughfare system will provide for traffic movements between points in outlying areas and the central area. The following existing facilities comprise the radial system:

1) US 70 Business is the major radial for the Smithfield area. It is recommended to widen US 70 Business to 4 lanes from US 301 to US 70. This will require replacing the Seaboard Coast Line Railroad bridge. The design year traffic volume on US 70 Business near the railroad bridge is projected to be 18,000 vehicles per day. The overpass bridge was built in 1937 and the CSX is maintaining it. According to CSX officials, replacing the railroad bridge is expensive but possible and has to be coordinated with the Public Transportation & Rail Division of North Carolina Department of Transportation. Replacing the railroad bridge will create the opportunity to fix the long existing drainage problem under the bridge.

2) US 70-A is expected to carry about 9,000 vehicles per day by year 2020. The existing 2-lane facility is adequate.

3) NC 210 is expected to carry 10,200 vehicles per day by the year 2020. It is recommended to widen NC 210 from a 22-foot section to a 24-foot section.

4) US 301 is recommended to be widened to a 5-lane urban section from US 701 south of the Planning Area to Brogden Road (SR 1007) and from SR 1927 (Anderson Street) to NC 39 north of the Planning Area.

5) SR 1003 (Buffaloe Road) is recommended to be widened to 24-foot section with 2-foot paved shoulders from SR 1923 (Booker Dairy Road) to the northern Planning Area boundary. Due to the proximity of a major oil terminal which is located just west of Selma and along SR 1003, large numbers of the petroleum trucks use this road and the wider road will provide for safer and more efficient travel.

6) SR 1929 (Oak Street) is recommended to be extended to Anderson Street. The new connector is proposed to be a 24-foot section.

7) NC 39 - Adequate.

8) NC 96 - Adequate.

9) SR 1001 (Lizzie Street) - Adequate.

10) SR 1007 (Brogden Road) - Adequate.

11) SR 1010 (Cleveland Road) - Adequate.

12) SR 1913 (Poplar Road) - Adequate.

13) SR 1927 (West Main Street in Pine Level) - Adequate.

14) SR 2309 (Peedin Avenue in Pine Level) - Adequate.

15) SR 2310 (Davis Mill Road) - Adequate.

16) SR 2374 (Blanche Street) - Adequate.

Crosstown Streets

The crosstown streets provide for travel across and through the central area. The following existing streets comprise the crosstown streets in the Planning Area:

1) Third Street in Smithfield - It is recommended that the offset intersection of North Street and Third Street and Buffaloe Road be corrected.

2) Second Street in Smithfield - Adequate.

3) Hospital Road in Smithfield - Adequate.

4) Anderson Street in Selma - Adequate.

5) Noble Street in Selma - Adequate.

6) Webb Street in Selma - Adequate.

7) Forrest Street in Selma - Adequate.

8) Blanche Street in Pine Level - Adequate.

Other Major Thoroughfares

1) SR 1923 (Booker Dairy Road) is recommended to be extended across the Neuse River and connect to US 70 Business near West Smithfield and to extend south to connect to Peeden Road. A 2-lane, 24-foot section with 2-foot paved shoulders and turn lanes is recommended for Booker Dairy Road and its extensions.

2) SR 1341 (Rand Road) is recommended to be widened to 24 feet with 2-foot paved shoulders.

3) SR 2137 (Pittman Road) - It is recommended that the offset intersection of SR 1001 (Lizzie Mill Road) and SR 2137 (Pittman Road) and SR 2309 (Peedin Avenue) near Pine Level be corrected.

Other Minor Thoroughfares

Minor thoroughfares carry out a collector-distributor function and perform a greater land service function than do the major thoroughfares. These streets are as follows:

1) Second Street in Smithfield - Adequate.

2) Johnston Tech Road is recommended to be aligned with SR 2398 (Industrial Park Drive) to provide route continuity.

3) Old Depot Road - Adequate.

4) SR 2500 - Adequate.

5) SR 2548 - Adequate.

6) SR 2398 (Industrial Park Drive) - Adequate.

7) Peeden Road - Adequate.

8) Canterbury Road is recommended to be aligned with Peeden Road and also connect to Parkway Drive.

9) East Berkshire Road is recommended to be aligned with West Berkshire Road at their intersection with Hospital Road.

10) West Street in Selma is recommended to be extended to connect to US 301.

11) Crestwood Church Road in Smithfield is recommended to be paved and extended to connect to Booker Dairy Road.

12) Jones Street is recommended to be extended to connect to West Street Extension, Eason Lane Extension and Crestwood Church Road.

13) Eason Lane is recommended to connect to Jones Street Extension.

14) SR 2302 (Rick Street) - Adequate.

15) SR 2383 (Preston Street) - Adequate.

16) SR 2332 (Webb Street) - Adequate.

17) SR 1928 (River Road) - Adequate.

18) SR 2305 - Adequate.

19) SR 2375 - Adequate.

20) SR 2380 is recommended to be extended to connect to SR 1001 (Lizzie Mill Road).

There are some two-lane roads in the Smithfield, Selma and Pine Level area which have paved widths less than 22 feet. This is the minimum desirable cross-section. A desirable lane width of 12 feet yields a 24-foot paved roadway. Narrow roadways increase the likelihood of accidents between vehicles traveling in the opposite direction. This becomes more critical as traffic increases to 5,000 or 6,000 vpd as there is increased incidence of meeting oncoming traffic.

Cross-sections - Each facility on the Thoroughfare Plan is discussed earlier in this chapter. A summary of the recommended cross-sections for each facility is in Appendix D. The minimum desirable cross-section is twenty-four feet with paved shoulders or curb and gutter.

System Improvements - Often system improvements can provide additional capacity or improved traffic conditions with a minimum of capitol outlay. Recommended system improvements include:

1) Consideration of an aggressive carpool/vanpool program and collection of vehicle occupancy count data. The capacity of a facility to carry people can be increased by increasing the occupancy of the existing vehicles.

2) Encouraging local businesses to stagger work hours will decrease traffic volumes in the peak travel hours.

3) A continuing program to assure proper timing and phasing of all traffic signals will reduce traffic delays. Proper signal progression can have significant positive impact on a corridor; this is especially true with US 70 Business, US 70 and US 301. The Traffic Engineering Branch of the North Carolina Department of Transportation is implementing some new high impact congestion management strategies and techniques. As for the Planning Area, implementation of a fully actuated, closed loop signal system controlling five existing major intersections located along US 301 and US 70 in Selma is underway. The following are the five intersections included in the system:

    US 70 & US 301;
    US 70 & Ricks Road;
    US 70 & I-95 North Bound Ramp;
    US 70 & US 70-A; and
    US 301 & Shopping Center.

4) Protection of access control is one of the areas where a significant contribution can be made. The limiting of driveway permits along US 301 and US 70 Business and the construction of a controlled access US 301 Bypass are good places to begin.

5) Offset intersections contribute to congestion and by correcting the offset intersections, capacity and safety will be improved.

6) A single unprotected left turning car can take the capacity equivalent of five through vehicles. The cross-section recommendations presume that the left turns at key intersections are provided.

LEGEND

	EXISTING	PROPOSED
FREEWAYS	▬▬▬	▬ ▬ ▬
MAJOR THOROUGHFARES	▬▬▬	▬ ▬ ▬
MINOR THOROUGHFARES	▬▬▬	▬ ▬ ▬
INTERCHANGES	●	●
GRADE SEPARATION	○	○

ADOPTED BY:

SMITHFIELD _____ MAY 7, 1992

SELMA _____ MAY 12, 1992

PINE LEVEL _____ MAY 5, 1992

STATEWIDE PLANNING BRANCH _____ MAY 18, 1992

N.C. DEPT. OF TRANSPORTATION _____

PUBLIC HEARING DATES _____ APRIL 21, 1992

SMITHFIELD

SELMA

PINE LEVEL

RECOMMENDED
THOROUGHFARE PLAN

SMITHFIELD
SELMA
PINE LEVEL

AND VICINITY

JOHNSTON COUNTY

NORTH CAROLINA

MARCH 30, 1992

VII. IMPLEMENTATION

When developing a thoroughfare plan, existing and future deficiencies in the transportation system are found and a strategy is devised to solve these problems by improving existing facilities and/or constructing new ones. Once this is done the plan must be implemented. Methods used to implement the thoroughfare plan as well as funding sources, environmental concerns and the anticipated costs are discussed in this chapter.

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a thoroughfare plan, the plan may be adopted by the governing body of the municipality and by the Department of Transportation to serve as the basis for future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways. Facilities which are designated a municipal responsibility will be constructed and maintained by the municipality.

After mutual plan adoption, the Department of Transportation will initiate negotiations leading to determining which of the existing and proposed thoroughfares will be a Department responsibility and which will be a municipal responsibility. Chapter 136, Article 3a, Section 136-66.1 of the General Statues provides guidance in the delineation of responsibilities. In summary, these statutes provide that the Department of Transportation shall be responsible for those facilities which serve volumes of through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality. The municipality is responsible for those facilities which serve primarily internal travel.

Thoroughfare plan adoption enables other planning tools such as the subdivision ordinances, zoning ordinances, official street map, and capital improvement programs to be used to assist in plan implementation and thus minimize public cost and land use disruption (See Table 5).

TABLE 5

FUNDING SOURCES AND METHODS RECOMMENDED FOR IMPLEMENTATION OF PROJECTS									
PROJECT	Funding Sources				Methods of Implementation				
	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Development Review
US 70 Bypass		X			X		X		X
Booker Dairy Road Extension		X		X	X	X	X		X
US 301 Bypass		X		X	X		X		X
West Street Extension	X			X	X	X			X
Jones Street Extension	X			X	X	X			X
Oak Street Extension	X			X	X	X			X

Methods Used to Protect Adopted Thoroughfare Plan

Subdivision Controls

A subdivision ordinance requires that every subdivider submit to the Municipal Planning Commission a plot of his or her proposed subdivision. Certain standards must be met by the developer before he or she can be issued a building permit to construct the development. Through this process, it is possible to reserve or protect the necessary rights-of-way for proposed streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan.

Since some of the proposed thoroughfares, such as the US 301 Bypass, are outside the existing Smithfield, Selma and Pine Level Town Limits, it is recommended that additional building setbacks and/or right-of-way reservation conforming to the Smithfield, Selma, and Pine Level Thoroughfare Plan recommendations also be adopted in the Johnston County Thoroughfare Plans. This will allow for orderly implementation of the plan in fringe areas without disrupting adjoining land owners.

Zoning

A zoning ordinance can be beneficial to thoroughfare planning by designating appropriate locations of various land uses and setting allowable densities of residential development. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares and (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Future Street Line Ordinances

This ordinance is a particular benefit where widening of a street will be necessary at some time in the future. A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. Through a metes-and-bounds description of a street's future right-of-way requirements, the municipalities may prohibit new construction or reconstruction of structures within the future right-of-way. This approach requires specific design of the facility and would usually require surveys and public hearings to allow affected property owners to know what to expect and to make necessary adjustments without undue hardship. A specific ordinance can be enacted for selected

Roads, such as US 301 in Smithfield and Selma and US 70 Business east of US 301 in Smithfield.

Development Reviews

Often the municipality is the first point of contact for development interest. Any development that may impact a State maintained street or highway must be reviewed by the Department of Transportation. For example, driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and the Traffic Engineering Branch of the Department of Transportation prior to access being allowed. If this is done at an early stage it is often possible to significantly improve the development's accessibility at minimal expense. In the case of thoroughfare planning, if a shopping center or industry is going to locate in the path of a proposed roadway, the review process may provide an opportunity to modify the site to allow for the future roadway.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." For cities contemplating the adoption of a Roadway Corridor Map, more commonly referred to as an Official Street Map, there are several things to consider prior to implementation. First and foremost, it should be recognized that an Official Street Map designation places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition for a period of up to three years on the issuance of building permits or the approval of subdivisions of property lying within an Official Street Map corridor. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the statute, a project being considered for an Official Street Map must be programed in the State's Transportation Improvement Program (TIP) or included in a locally adopted Capital Improvements Program in addition to appearing on the adopted street system plan. The Statute states that the Capital Improvements Program must be for a period of ten years or less and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact this branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

NC Department of Transportation
Program and Policy Branch
Post Office Box 25201
Raleigh, NC 27611

Funding Sources

Capital Improvement Program

A capital improvement program makes it easier to build a planned thoroughfare system. This capital improvement program consists of two lists of projects. The first is a list of highway projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list of local projects designated as State responsibility to be included in the Transportation Improvement Program.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects such as the extension of Booker Dairy Road to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an Industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The current maximum amount is $150,000 per year per project. A town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process".

2. Enact a bond issue to fund street improvements.

3. Consider the possibility of specific projects qualifying for federal demonstration projects funds.

4. Adopt a collector street plan that would assess the buyer or property owners for street improvement.

5. Charge a special assessment for utilities; for example increase water and sewer bills to cover the cost of street improvements.

Environmental Concerns

The importance of the environment is becoming increasingly apparent and there is a need to make every effort to preserve it. In looking at proposed thoroughfares it is desirable to locate a corridor that will do the least amount of damage to the environment. Environmental factors usually considered in highway project evaluation can be divided into three major categories--physical, social and/or cultural, and economic environmental considerations (Table 7). Many of these are accounted for when a project is evaluated with respect to user benefits, cost and economic development potential. However, thirteen additional environmental factors need to be considered in these evaluations. They are the environmental impacts of a project on (1) air quality (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) park and recreational facilities, (11) historic sites and landmarks, (12) public health and safety, and (13) aesthetics.

The summation of both positive and negative impacts probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

Table 7 may be used as a guideline for interpreting the "Probable Impact" values in Table 9.

TABLE 6

PROBABILITY ESTIMATION GUIDE	
Subjective Evaluation	Impact Probability
Excellent - very substantial	0.90
Very good - substantial	0.60
Fair - some	0.40
Poor - none	0.10

TABLE 7

Environmental Considerations		
Physical Environment	**Social and/or Cultural Environment**	**Economic Environment**
Air Quality	Housing	Businesses
Water Resources	Neighborhoods	Employment
Wildlife	Noise	Economic Development
Vegetation	Education Facilities	Public Utilities
	Churches	Transportation Costs
	Park and Recreational Facilities	Capital Costs
	Public Health and Safety	Operation and Maintenance Costs
	Aesthetics	

Listed below are impacts associated with the recommended thoroughfare plan:

- The construction of the Booker Dairy Road Extension will cause both positive and negative impacts. The positive impacts are: (1) the proposed roadway

will reduce travel time for the travellers between West Smithfield and US 301 to I-95; (2) the proposed roadway will reduce the number of accidents on US 70 Business by decreasing the number of vehicles in downtown Smithfield and will provide a safer environment for motorists; and (3) Booker Dairy Extension will allow another Neuse River crossing into Smithfield from the west. The negative impact is due to crossing of the Neuse River and the wetlands and wildlife habitat associated with the Neuse River.

- The construction of the US 301 Bypass also has both positive and negative impacts. The positive impacts are: (1) the bypass will reduce congestion on Pollack Street and Selma Road (existing US 301 through Selma and Smithfield) and should lower carbon monoxide levels improving air quality; and (2) the US 301 Bypass should stimulate and provide for the growth and development in the Planning Area. The negative impact is due to crossing of the Neuse River and the wetlands and streams associated with the Neuse River. It is suggested that the use of "best management practices" (reduce side slopes, no staging in lowland sites, minimize wetland canopy removal, limited fill placement, etc.) be employed in an effort to minimize impacts to affected wetlands. Replacement of filled wetlands could be mitigated by the creation of enhancement areas contiguous to existing wetlands adjacent to the project.

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The potential cost estimate of four major projects for the Planning Area are given in Table 9. The evaluation of these projects with respect to user benefits, probability that economic development will be stimulated and environmental impact is given in Table 10.

Thoroughfare improvement needs identified and evaluated in the Smithfield, Selma and Pine Level Thoroughfare Plan are:

- To complete construction of a US 70 Bypass of Smithfield which is under construction (TIP Project R-84)

- The extension of Booker dairy Road (SR 1923) to US 70 Business west of Smithfield.

- The construction of a US 301 Bypass northwest of Selma and Smithfield.

- The extension of West Street to US 301 in Selma.

TABLE 8

Potential Project Cost Estimates Investigated Projects		
Project	**Project Description**	**Total Cost Including R/W**
1	US 70 Bypass (R-84BA)	$11,415,000
2	Extension of Booker Dairy Road	$ 3,600,000
3	US 301 Bypass	$ 9,410,000
4	West Street Ext. to US 301	$ 900,000

TABLE 9

Benefits Evaluation for Investigated Projects						
Project	Benefits (1000's)	Costs (1000's)	Length Mile	Benefits per Mile	Econ. Dev. Potential	Eviron. Impact
US 70 Bypass R-84BA	$28,805	$11,415	3.30	$8,728	0.90	+0.6 -0.1
Booker Dairy Road Ext.	$20,740	$3,600	2.21	$9,384	0.60	+0.6 -0.3
US 301 Bypass	$43,410	$9,410	8.86	$4,899	0.60	+0.6 -0.3
West Street Extension	$2,352	$900	0.85	$2,767	0.40	+0.5 -0.0

APPENDICES

APPENDIX A

TRAVEL FORECASTING MODELS

In order to develop an efficient Thoroughfare Plan for the Smithfield, Selma and Pine Level Planning Area it was necessary to develop and calibrate a travel model of the Planning Area. To develop a traffic model, the following are necessary: (1) define the Planning Area, (2) collect traffic counts on existing streets and socio-economic data by traffic analysis zones, (3) determine the trip generation characteristics of the Planning Area, (4) calibrate the traffic model so that it duplicates traffic patterns of the Planning Area, (5) project the socio-economic data to the design year, (6) estimate design year travel demand. Figure A-1 illustrates the modeling process. Once the socio-economic data has been projected to the design year the model may be used to estimate design year traffic volumes, evaluate various street system deficiencies, and evaluate alternate solutions to the problems.

The Planning Area and Street Network

Figure 3 in Chapter III shows the Planning Area and its division into 97 zones. Two control lines called screen lines A and B were drawn across the Planning Area. The screen lines are used in calibrating the traffic model. Traffic counts along these lines indicate how much traffic is moving from one side of the Planning Area to another. The screen lines follow natural boundaries in order to minimize the number of places that traffic can cross them. Screen Line A runs east to west starting at the Planning Area boundary south of the intersection of US 70-B and SR 1586 and crosses SR 1501, SR 1913, SR 1003, US 301, SR 2398, I-95, US 70-B and SR 1007. Screen Line B begins on the southwest side of the Planning Area and runs northeast following the Seaboard Coast Line Railroad and crosses US 301, SR 2500, SR 1007, Lee Street, US 70-B, US 70-A, SR 2302, Preston Street, Anderson Street and SR 1001.

The Planning Area was divided into 97 zones for data collection and aggregation. The data from the dwelling unit survey and the employment survey were collected on the basis of these traffic zones (See Tables A-2 and A-3). The projection of the socio-economic data to the future year is also done on the basis of traffic zones (See Tables A-4 and A-5). Traffic zone boundaries are based, where possible, on physical features to aid in on-the-ground recognition.

The Base Year Network

The purpose of the traffic model is to replicate the existing traffic volumes on the transportation system. Therefore, it is necessary to represent the existing transportation system in a realistic model. There is a delicate balance between having too many streets on the model thereby hindering calibration and not having enough streets to realistically duplicate existing conditions. Generally all the major arterials and major collector streets need to be represented in the system model. The major highways represented by the model are: I-95, US 70, US 70-A, US 70 Business, US 301, NC 96, NC 39, NC 210, SR 1003, SR 1007, SR 1001, SR 1927, SR 1913 and SR 1010.

Street capacity is an important component of the model. The volume/capacity ratio (v/c) gives us our best indication of present and future traffic congestion. The capacity ranges for the Smithfield, Selma and Pine Level Planning Area model are shown in Table A-1.

Speed and distance are the major factors that define the minimum time paths from zone to zone. The model uses the minimum time paths as the basis for assigning traffic to streets.

DATA REQUIREMENTS

In order to produce an adequate traffic model of the Planning Area, two additional types of data are required. First, traffic counts must be taken to provide a basis for calibrating the model. Second, socio-economic data (housing counts and an employment survey) are necessary in order to generate traffic for the model. The 1990 socio-economic data collected for the Planning Area are shown in Table A-2 and Table A-3.

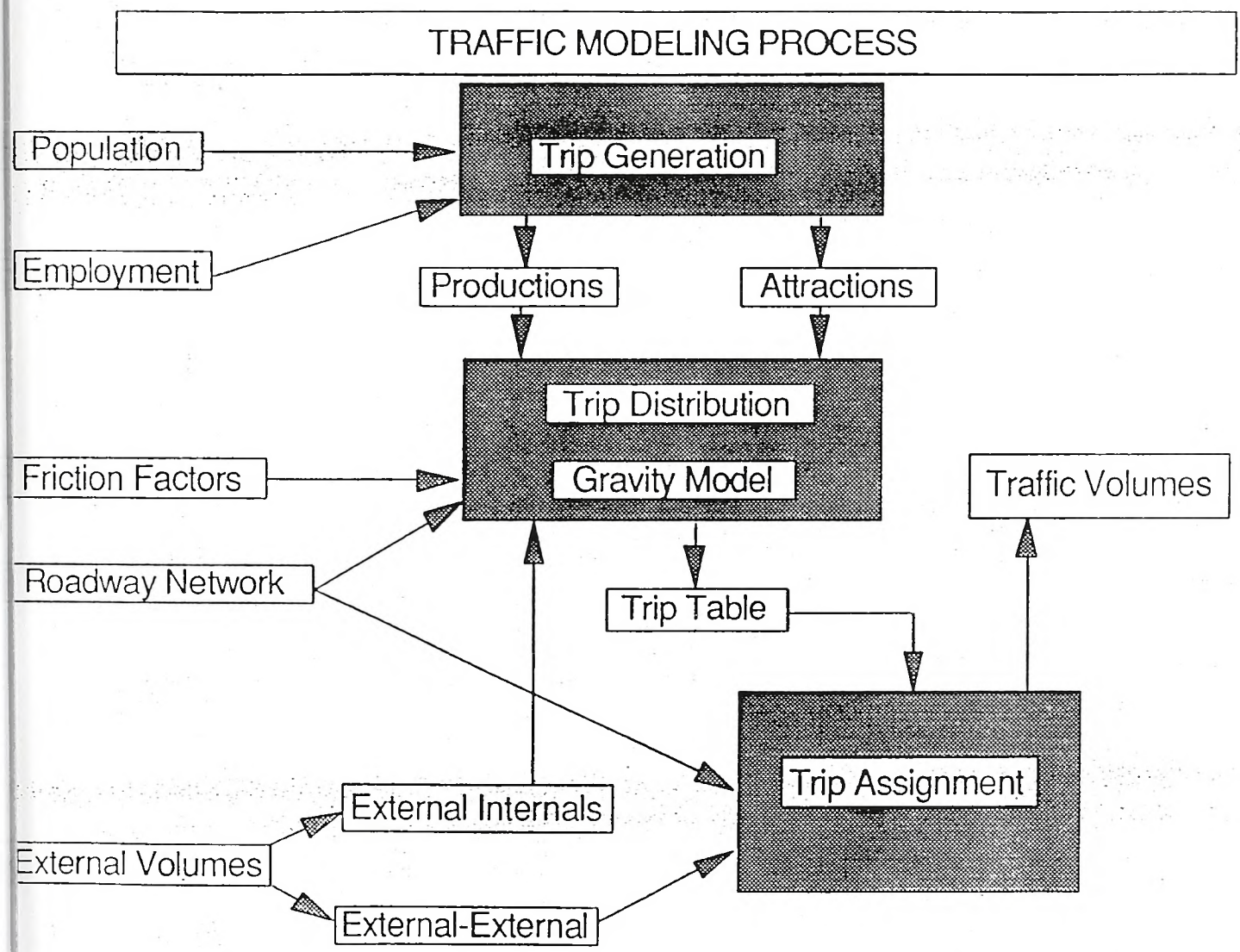

TRAFFIC MODELING PROCESS
Population
Employment
Trip Generation
Productions
Attractions
Trip Distribution
Gravity Model
Friction Factors
Roadway Network
Traffic Volumes
Trip Table
Trip Assignment
External Internals
External Volumes
External-External

FIGURE A-1

TABLE A-1

DAILY CAPACITY FOR LEVEL OF SERVICE "D"			
SECTION	RURAL	SUBURBAN	URBAN
FREEWAY			
4-LANE	54,000	54,000	54,000
6-LANE	81,000	81,000	81,000
DIVIDED			
4-LANE	50,000	37,000-41,700	18,000-22,000
6-LANE	75,700	56,500-62,600	30,000-34,000
UNDIVIDED			
3-LANE	23,200	20,300-21,400	12,000-16,000
4-LANE	48,000	33,500-39,400	18,000-22,000
5-LANE	49,000	35,600-39,400	24,000-28,000
6-LANE	71,900	50,300-55,700	30,000-34,000
7-LANE	73,400	53,400-59,200	36,000-40,000
TWO-LANE			
9' LANES	9,000	8,500	8,000
10' LANES	11,000	10,500	9,500
11' LANES	12,000	11,500	11,000
12' LANES	13,000	12,500	12,000

Traffic Counts

The model must be calibrated against existing conditions in the Planning Area. In order to calibrate the model, traffic counts must be taken at various locations around the Planning Area. The traffic counts for the Smithfield, Selma, Pine Level Study were taken during July, 1990. The traffic counts were divided into three types:

Cordon line counts were taken at all locations where streets or highways crossed the Planning Area boundary. These counts show how much traffic is entering and leaving the Planning Area. Cordon line counts on major highways were counted over a 72-hour period with traffic volumes recorded hourly.

Traffic counts were taken everywhere that a street crossed a screen line. These counts were used to determine the volume of traffic moving across major portions of the Planning Area. These counts were also the primary accuracy check of the traffic model. All of the screen line counts were 72-hour machine recording counts.

Other traffic counts, coverage counts, were taken on various streets and highways within the Planning Area. These traffic counts were taken over a 24-hour period and show the volume during the 24-hour period. These coverage counts are a secondary accuracy check on the model. The model can be calibrated and fine tuned to closely duplicate the existing traffic on existing streets using the coverage count volumes.

A single vehicle classification count was taken on US 70 Business at the Neuse River crossing. This traffic count, in addition to giving an indication of the number of vehicles using the road, gives some indication of the vehicle mix.

Socio economic Data

The required socio economic data has two forms: a dwelling unit count and an employment survey. The dwelling unit count is used as the generator of traffic. Employment is used as a trip attractor in the model. The model assumes that dwelling units produce trips while jobs attract trips.

The best indicator of the average number of trips made from a household in a day is the household income. Since there is no adequate method for determining household income, the type and quality of housing is used as an indicator of household income. The housing inventory is divided into five categories: excellent, above average, average, below average, and poor. Each of the housing categories has a slightly different trip generation rate. Table A-2 shows the housing counts for each traffic zone.

The employment survey of the Planning Area was classified by Standard Industrial code into 5 categories (See Table A-3):

1. Industrial including agriculture and construction (SIC 1-49)
2. Retail and Wholesale (SIC 50-54, 56, 57, 59)
3. Special Sales (Restaurants and Gas Stations) (SIC 55, 58)
4. Office (Private and Government) (SIC 60-67, 91-97)
5. Professional Services (SIC 70-89)

The category totals, by zone, were input into a regression equation which produces an attraction factor for each zone.

TABLE A-2
PLANNING AREA DWELLING UNIT SUMMARY 1990

ZONE	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	TOTAL DU'S
1	0	4	39	87	98	228
2	0	15	56	90	55	216
3	0	18	73	42	0	133
4	0	13	61	88	5	167
5	19	72	9	38	0	138
6	0	27	73	0	0	100
7	4	44	0	0	0	48
8	0	0	7	262	2	271
9	0	0	0	30	39	69
10	0	0	6	38	20	64
11	1	12	78	0	0	91
12	13	41	58	0	0	112
13	0	3	25	62	43	133
14	0	0	5	35	45	85
15	0	0	0	20	54	74
16	0	7	58	26	7	98
17	0	0	1	77	15	93
18	0	1	4	131	202	338
19	0	0	0	0	0	0
20	14	26	23	39	21	123
21	0	0	6	29	6	41
22	0	4	23	65	49	141
23	1	4	19	51	75	150
24	7	19	7	10	3	46
25	0	1	41	16	32	90
26	17	35	8	3	11	74
27	0	3	6	16	11	36
28	0	4	14	30	4	52
29	0	4	25	6	9	44
30	0	4	13	8	0	25
31	0	0	3	8	8	19
32	0	1	17	36	16	70
33	0	1	6	15	18	40
34	0	4	27	6	0	37
35	0	0	1	14	10	25
36	0	0	0	10	1	11
37	0	6	0	5	6	17
38	0	0	0	17	32	49
39	0	7	38	26	14	85
40	1	5	24	26	12	68
41	0	0	5	6	0	11
42	0	0	12	15	79	106
43	0	0	5	15	49	69
44	0	10	29	14	2	55
45	0	8	50	54	14	126
46	1	4	32	41	8	86
47	0	5	11	41	8	65
48	1	5	18	27	9	60
49	0	2	6	42	15	65
50	0	2	4	19	9	34

TABLE A-2
PLANNING AREA DWELLING UNIT SUMMARY 1990

ZONE	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	TOTAL DU'S
51	0	1	3	12	16	32
52	0	0	1	29	3	33
53	0	0	3	115	14	132
54	0	0	2	3	1	6
55	0	0	1	3	2	6
56	0	0	2	102	15	119
57	0	0	0	0	0	0
58	0	0	9	70	24	103
59	1	3	18	18	1	41
60	0	2	38	44	7	91
61	0	0	7	8	2	17
62	0	2	6	19	7	34
63	0	4	24	62	18	108
64	0	4	10	35	7	56
65	0	4	23	53	15	95
66	3	9	16	26	15	69
67	0	0	4	21	13	38
68	0	0	10	46	42	98
69	0	0	2	8	8	18
70	0	0	5	92	71	168
71	0	0	17	50	42	109
72	0	2	2	61	115	180
73	0	3	2	33	35	73
74	0	1	14	116	45	176
75	0	0	9	36	10	55
76	4	48	126	32	65	275
77	0	5	64	29	13	111
78	0	0	27	56	6	89
79	0	0	16	118	30	164
80	0	11	49	76	12	148
81	0	1	9	56	11	77
82	0	65	121	90	15	291
83	0	6	66	55	20	147
84	0	2	69	136	10	217
85	0	2	103	86	20	211
86	0	2	21	24	12	59
87	1	3	10	23	11	48
88	0	6	138	56	4	204
89	1	4	120	205	10	340
90	0	1	4	25	25	55
91	0	5	15	22	6	48
92	0	4	7	18	76	105
93	0	3	112	58	60	233
94	0	0	0	0	0	0
95	0	0	3	7	6	16
96	2	11	43	26	0	82
97	2	7	15	30	1	55
TOTALS	93	642	2392	4026	2057	9210

TABLE A-3
PLANNING AREA EMPLOYMENT SUMMARY 1990

ZONE	SIC 1-49 INDUSTRY	50-54, 56,57,59 SALES	55,58 SPECIAL SALES	60-67 91-97 OFFICE	70-89 SERVICE	TOTAL EMP.	COMMERCIAL CAR AND TRUCK
1	28	53	55	51	38	225	21
2	13	39	44	170	97	363	35
3	5	56	24	130	602	817	59
4	12	42	3	7	58	122	6
5	0	0	0	7	0	7	0
6	0	0	0	0	72	72	0
7	0	0	0	0	9	9	2
8	0	0	10	0	0	10	0
9	6	42	4	25	1	78	14
10	45	83	15	17	2	162	10
11	0	0	0	20	4	24	0
12	61	7	15	0	5	88	3
13	69	24	52	7	138	290	8
14	0	5	11	12	645	673	2
15	238	99	28	0	19	384	17
16	12	10	18	0	1	41	12
17	0	0	12	64	55	131	29
18	0	6	7	0	0	13	1
19	714	0	0	0	0	714	6
20	3	82	10	77	170	342	27
21	0	0	0	40	15	55	0
22	0	28	5	17	0	50	6
23	155	0	40	16	21	232	23
24	0	0	0	17	0	17	1
25	0	33	1	4	0	38	5
26	14	16	0	4	24	58	15
27	0	0	0	0	0	0	0
28	54	5	0	0	0	59	13
29	12	0	13	85	35	145	15
30	0	0	0	0	0	0	0
31	0	2	17	1	0	20	4
32	250	0	3	1	0	254	2
33	65	10	0	2	0	77	4
34	40	349	37	0	6	432	0
35	0	0	0	2	0	2	0
36	0	0	0	0	0	0	0
37	16	4	2	0	0	22	4
38	0	2	0	2	10	14	4
39	9	7	14	12	0	42	5
40	0	0	4	3	0	7	0
41	4	39	27	0	0	70	7
42	0	0	9	0	0	9	6
43	0	0	0	2	0	2	0
44	0	2	1	5	2	10	0
45	4	0	0	0	0	4	2
46	0	6	14	0	15	35	3
47	170	15	2	9	2	198	1
48	6	0	0	0	0	6	1
49	22	0	12	16	0	50	8
50	0	0	0	0	0	0	0

TABLE A-3
PLANNING AREA EMPLOYMENT SUMMARY 1990

ZONE	SIC 1-49 INDUSTRY	50-54, 56,57,59 SALES	55,58 SPECIAL SALES	60-67 91-97 OFFICE	70-89 SERVICE	TOTAL EMP.	COMMERCIAL CAR AND TRUCK
51	0	0	0	0	0	0	0
52	26	0	0	0	0	26	6
53	0	0	0	0	0	0	0
54	0	2	0	0	0	2	0
55	311	8	0	4	0	323	9
56	10	141	90	126	10	377	7
57	564	39	0	0	40	643	20
58	0	8	0	22	0	30	10
59	0	0	0	0	0	0	0
60	83	0	1	6	0	90	55
61	25	3	0	0	0	28	2
62	7	19	30	0	0	56	5
63	4	23	4	45	0	76	15
64	5	0	0	3	0	8	0
65	4	3	0	0	0	7	0
66	6	0	2	15	324	347	91
67	3	1	0	0	0	4	2
68	10	51	48	96	43	248	12
69	47	160	72	21	8	308	14
70	0	3	0	0	8	11	0
71	10	33	5	22	2	72	10
72	0	8	7	2	27	44	13
73	43	34	7	45	15	144	7
74	14	13	0	34	0	61	6
75	194	2	0	0	0	196	1
76	0	4	0	1	8	13	5
77	14	4	5	124	0	147	0
78	0	0	0	0	0	0	0
79	0	0	1	3	0	4	0
80	0	0	0	0	0	0	0
81	0	3	0	4	0	7	1
82	10	391	54	164	94	713	19
83	0	0	1	55	0	56	0
84	22	0	0	160	0	182	1
85	62	10	0	3	0	75	3
86	0	0	0	0	0	0	0
87	40	0	0	0	0	40	0
88	0	82	11	9	14	116	0
89	0	0	0	0	0	0	0
90	5	36	29	24	0	94	7
91	19	22	2	4	4	51	12
92	0	0	4	2	0	6	0
93	194	38	60	202	18	512	4
94	0	4	30	355	0	389	15
95	0	6	0	2	0	8	0
96	59	64	17	51	128	319	17
97	1	20	0	59	0	80	0

TABLE A-4
PLANNING AREA DWELLING UNIT SUMMARY 2020

ZONE	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	TOTAL DU'S
1	0	30	89	68	75	262
2	0	55	76	60	40	231
3	0	28	83	29	0	140
4	0	20	74	76	0	170
5	23	80	21	27	0	151
6	0	42	84	0	0	126
7	20	66	12	0	0	98
8	0	0	57	255	0	312
9	0	0	24	23	31	78
10	0	0	31	28	14	73
11	7	23	86	0	0	116
12	28	66	93	0	0	187
13	0	19	54	63	35	171
14	0	14	30	28	38	110
15	0	14	40	21	40	115
16	0	25	98	32	0	155
17	0	0	16	94	8	118
18	0	10	42	152	186	390
19	0	0	0	0	0	0
20	34	46	51	34	16	181
21	0	10	36	33	2	81
22	0	19	58	67	40	184
23	9	26	64	54	64	217
24	23	41	40	17	1	122
25	0	30	81	30	25	166
26	33	57	40	1	4	135
27	0	13	26	31	6	76
28	0	14	30	35	1	80
29	0	18	43	7	4	72
30	0	11	23	11	0	45
31	0	9	22	19	4	54
32	0	11	35	48	8	102
33	0	14	24	25	10	73
34	0	14	43	3	0	60
35	0	0	26	40	2	68
36	0	0	20	22	0	42
37	0	20	13	8	3	44
38	0	0	16	29	24	69
39	0	17	60	50	6	133
40	3	14	50	33	8	108
41	0	5	20	20	0	45
42	0	8	40	20	64	132
43	0	10	50	40	35	135
44	0	26	57	25	0	108
45	0	20	90	70	5	185
46	4	12	45	56	3	120
47	0	15	25	50	2	92
48	8	20	40	40	0	108
49	0	14	26	60	10	110
50	0	16	30	30	8	84

TABLE A-4
PLANNING AREA DWELLING UNIT SUMMARY 2020

ZONE	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	TOTAL DU'S
51	0	11	20	30	20	81
52	0	0	30	45	2	77
53	20	35	129	130	10	324
54	0	0	7	5	2	14
55	0	15	21	2	0	38
56	0	0	22	117	8	147
57	0	0	0	0	0	0
58	120	90	109	60	13	392
59	21	21	27	14	0	83
60	0	24	53	55	1	133
61	0	0	29	33	5	67
62	0	10	30	40	2	82
63	0	14	60	60	7	141
64	0	25	35	45	2	107
65	28	170	135	35	6	374
66	16	28	106	20	10	180
67	0	20	40	20	6	86
68	0	10	40	57	36	143
69	0	10	35	20	5	70
70	0	10	70	82	45	207
71	0	10	60	60	25	155
72	0	15	35	65	90	205
73	0	22	32	20	20	94
74	0	7	40	130	37	214
75	0	0	18	46	5	69
76	8	57	142	19	54	280
77	0	15	90	35	6	146
78	0	0	60	60	2	122
79	0	0	38	122	20	180
80	0	11	60	80	7	158
81	0	4	16	70	6	96
82	0	70	151	100	7	328
83	0	20	126	62	10	218
84	0	34	229	160	4	427
85	0	40	243	93	7	383
86	0	40	51	25	7	123
87	10	53	150	10	5	228
88	0	34	268	66	1	369
89	1	6	180	210	3	400
90	0	1	68	51	13	133
91	0	10	37	37	2	86
92	0	14	57	13	61	145
93	0	8	172	60	50	290
94	0	0	0	0	0	0
95	0	10	15	19	3	47
96	2	18	70	20	0	110
97	2	9	35	34	0	80
TOTALS	420	2023	5675	4501	1447	14066

TABLE A-5
PLANNING AREA EMPLOYMENT SUMMARY 2020

ZONE	SIC 1-49 INDUSTRY	50-54, 56,57,59 SALES	55,58 SPECIAL SALES	60-67 91-97 OFFICE	70-89 SERVICE	TOTAL EMP.	COMMERCIAL CAR AND TRUCK
1	33	62	64	59	44	262	34
2	15	45	51	197	113	421	48
3	6	65	28	699	151	949	69
4	14	49	3	67	8	141	9
5	0	0	0	8	0	8	0
6	0	0	0	84	0	84	0
7	0	0	0	10	0	10	4
8	0	0	12	0	0	12	0
9	7	49	5	1	29	91	21
10	52	96	17	2	20	187	15
11	0	0	0	5	23	28	0
12	71	8	17	0	6	102	6
13	80	57	69	14	160	380	12
14	0	6	13	23	680	722	4
15	276	115	33	20	0	444	19
16	14	12	21	0	1	48	24
17	0	0	14	74	64	152	26
18	0	7	8	0	0	15	2
19	829	0	0	0	0	829	9
20	3	95	12	197	89	396	37
21	0	0	0	46	17	63	0
22	0	38	10	10	30	88	9
23	180	0	46	19	24	269	29
24	0	0	0	20	0	20	2
25	0	38	1	5	0	44	9
26	16	19	0	28	5	68	19
27	0	0	0	0	0	0	0
28	63	6	0	0	0	69	19
29	14	0	15	41	99	169	19
30	0	0	0	0	0	0	0
31	0	4	20	2	2	28	7
32	290	12	3	2	2	309	4
33	75	12	0	2	2	91	6
34	60	395	43	7	0	505	0
35	46	0	10	10	8	74	0
36	0	0	0	0	0	0	0
37	19	5	2	0	0	26	6
38	0	2	0	12	2	16	6
39	10	8	16	14	0	48	7
40	10	10	15	3	8	46	0
41	9	45	31	30	20	135	8
42	0	0	10	0	0	10	9
43	0	0	0	2	0	2	0
44	0	2	1	6	6	15	0
45	5	0	0	0	0	5	3
46	0	7	16	17	0	40	5
47	197	17	2	2	10	228	2
48	7	0	0	0	0	7	2
49	26	0	14	0	19	59	10
50	0	0	0	0	0	0	0

TABLE A-5
PLANNING AREA EMPLOYMENT SUMMARY 2020

ZONE	SIC 1-49 INDUSTRY	50-54, 56,57,59 SALES	55,58 SPECIAL SALES	60-67 91-97 OFFICE	70-89 SERVICE	TOTAL EMP.	COMMERCIAL CAR AND TRUCK
51	0	0	0	0	0	0	0
52	30	0	0	0	0	30	8
53	50	10	10	10	0	80	0
54	50	2	0	0	0	52	0
55	320	9	0	0	4	333	10
56	12	161	100	130	12	415	7
57	600	45	0	46	0	691	28
58	100	9	20	0	26	155	13
59	100	20	30	12	0	162	0
60	196	50	31	20	17	314	75
61	29	23	34	50	100	236	2
62	58	52	35	10	0	155	9
63	5	27	5	0	52	89	25
64	6	0	0	0	3	9	0
65	15	23	10	50	60	158	0
66	7	0	2	376	17	402	135
67	3	1	0	0	0	4	4
68	12	59	56	50	111	288	22
69	55	186	84	9	23	357	24
70	0	3	0	9	0	12	0
71	12	38	6	2	26	84	20
72	0	9	8	31	2	50	23
73	50	39	8	20	52	169	17
74	16	15	0	0	39	70	11
75	225	2	0	0	0	227	3
76	0	5	0	9	1	15	6
77	16	5	6	0	144	171	0
78	0	0	0	0	0	0	0
79	0	0	1	3	3	7	0
80	0	0	0	0	0	0	0
81	0	3	0	4	6	13	2
82	12	400	64	175	100	751	26
83	50	60	61	50	64	285	0
84	76	50	20	60	186	392	2
85	72	12	0	0	3	87	4
86	100	40	20	80	50	290	0
87	146	30	10	60	20	266	0
88	0	85	13	16	10	124	0
89	0	0	0	0	0	0	0
90	6	42	34	0	28	110	10
91	22	26	2	5	5	60	19
92	0	0	5	2	2	9	0
93	232	44	70	21	228	595	5
94	0	5	35	0	412	452	19
95	0	7	0	0	2	9	0
96	69	74	20	149	59	371	27
97	1	23	0	0	69	93	0

Trip Generation

The trip generation process is the process by which external station volumes, housing data, commercial vehicles inventory, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. Through trip tables are developed using the Modlin approach.1 The gravity model is used to distribute the internally generated trips and the external-internal trips.

Traffic inside the planning area has three major components through trips, internal-external trips, and internal trips. The technical definition of a trip is slightly different than the definition of a trip used by the general public. Technically a trip only has one origin and one destination while the layman will often group, or chain, several short trips together as one longer trip. Through trips are produced outside the planning area and pass through the planning area enroute to a destination outside the planning area. Internal-external trips have one end point inside the planning area and one end point outside the planning area. Internal trips have both their origin and destination inside the planning area.

For clarity the internal trips are further subdivided into trip purposes. The trip purposes for Planning Area are: home-based work, other-home based, and non-home based.

Internal Data Summary

The Internal Data Summary (IDS) is the process that takes the external-internal traffic volumes, housing data, employment data, generation rates, and regression equations and generates the trip productions and trip attractions required by the gravity model. IDS is a simplified version of the Cross Class method of trip generation. The IDS process has been adapted to the microcomputer utilizing a PFS Plan Spreadsheet. The spreadsheet has three parts: housing/population worksheet, employment worksheet, and a calculation worksheet.

Housing units were stratified to account for differing trip generation rates for each classification. Table A-6 shows the individual generation rates. The trip generation rates for commercial vehicles, and taxis are also included in the table. The individual trip generation rates give an average trip generation rate for the Planning Area of 7.07 trips per dwelling unit (DU).

1- Modlin, D. G., Synthesis of Through Trip Patterns in Small Urban area, Unpublished Thesis NCSU, 1971, Raleigh, N. C.

TABLE A-6

TRIP GENERATION BY HOUSING TYPE	
CLASSIFICATION	GENERATION RATE
EXCELLENT	12.0
ABOVE AVERAGE	10.0
AVERAGE	8.0
BELOW AVERAGE	7.0
POOR	5.0
COMMERCIAL VEHICLES	6.7
TAXI	40.0

Trip attractions were produced using the regression equations developed for the Roanoke Rapids, Weldon, and Gaston Thoroughfare Plan Study. The regression equations consider trip attractions to be related to the employment characteristics of the traffic zones. The equations estimating trip attractions are as follows:

OHB $Y = 0.1X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5$
NHB $Y = 0.2X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5$
EXT $Y = 0.5X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5$

WHERE: Y = Attraction factor for each zone by trip purpose

X_1 = Industry (SIC codes 1-49)
X_2 = Retail (SIC codes 50-54, 56, 57, 59)
X_3 = Special Retail (SIC codes 55, 58)
X_4 = Office (SIC codes 60-67, 91-97)
X_5 = Services (SIC codes 70-76, 78-89, 99)

Special Retail (X_3) which is made up of fast food restaurants, convenience stores, gas stations and banks with drive-in windows operate at much higher traffic generation rates than traditional retail establishments which are listed as Retail (X_2).

The zonal attraction factors thus derived were adjusted so that the total attractions equaled the total productions. This adjustment was done by multiplying each zonal attraction factor by the ratio of total productions to total unadjusted attractions for each trip category.

The total trips generated by dwelling units and commercial vehicles were summed to produce the total internally generated

trips. Total internal trips were reduced by a reduction factor of 0.85 to account for the trips made by vehicles garaged inside the Planning Area but with destinations outside the Planning Area (these trips are included in the external station counts). The adjusted internal travel was separated into three purposes: home-based work (HBW) 25%, other-home based (OHB) 53%, and non-home based (NHB) 22%. Added to these internally generated trips are a component of internal trips that are generated by vehicles garaged outside the Planning Area. These trips are called secondary non-home based (NHBS) trips and they are calculated as follows:

NHBS = Ext-Int Trips - Ext-Int Trips Garaged inside P. A. x Factor

Factor ranges from 0.4 to 0.7 depending on the opportunities to make extra trips. 0.45 was used to compute the secondary non-home based trips for the Planning Area.

1990 NHBS = 0.45 (63,972 - 8,432) = 24,993
2020 NHBS = 0.45 (120,752 - 14,144) = 47,973

The output of the IDS program are trip productions and trip attractions for each zone divided into four trip purposes. home-based work (HBW), home-based other (HBO), non-home based (NHB) and external-internal (EI). The trips are segregated into trip purposes because different trip length frequency curves are associated with each trip purpose.

Internal Trip Distribution

Once the number of trips per traffic zone is determined the trips must still be distributed to other traffic zones. The preferred method of distributing internal trips, called the Gravity Model, states that the number of trips between Zone A and Zone B is proportional to the number of trips produced in Zone A multiplied by the number of trips attracted to Zone B multiplied by a travel time factor.

The travel time factor or friction factor (F) is critical to the gravity model distribution and must be derived empirically in the absence of origin-destination data. The travel time factor is dependent on the distance between the traffic zones and the time necessary to travel between traffic zones. The travel time factor is also dependent on the trip purpose. Friction factors and travel curve data used in the Planning Area model are shown in Tables A-9 and A-10 respectively.

Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future point in time; however, if the model is not accurate it is useless for this purpose. Therefore the major test of a traffic model's validity is whether or not the model will duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, trip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which the model is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future year.

There are three checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice. The second check is to compare the model generated trips on the screenlines with the ground counts taken at the screenlines. A model is considered to accurately reflect the overall travel patterns if the model trips are from 95% to 105% of the ground counts on the screenlines. Table A-5 compares the ground counts with the model traffic volumes on the sreeenlines.

TABLE A-7

Actual vs. Modeled Screenline Totals

Screenline	Ground Count	Model Volume	Percent
A	76160	72888	96
B	68840	71801	96

The final check is to match the traffic volumes on the link counts with the ground counts on the links. The "link counts" can be used to find particular places in the network where there are problems.

Design Year Travel (Year 2020)

In order to make use of the model the base year data must be projected to reflect assumed conditions in the design year. Unfortunately development that will take place in the design year may not be in the places, size, or of the types anticipated. The Planning Area officials provided great assistance in the projection of socio-economic and land use data. The procedure in chapter III was utilized to project the population and employment of the Planning Area. Tables A-4 and A-5 show the projected socio-economic data for each zone.

The year 2020 travel was developed using the same techniques employed in synthesizing the 1990 travel. These travel patterns were estimated by using the design Year socio-economic data and utilizing the 1990 internal travel development procedures. The same trip generation rates were used for the year 2020 as for the base year 1990 (See Table A-6). These generation rates were applied to the DU's projected for each zone. The 2020 trip generation rates for trucks and commercially owned vehicles was assumed to remain at 6.7 trips per vehicle.

TABLE A-8

TRAVEL MODEL INPUT VARIABLES

TRIP PERCENTAGES BY PURPOSE	
Internal of Total	85%
HBW	25%
OHB	53%
NHB	22%

YEAR	PERSON/DU	PERSON/VEH
1990	2.5	1.15
2020	2.3	1.00

$$\text{INCREASE FOR GENERATION RATES} = \text{AVERAGE 1990 TRIP RATE} \times \text{COMPOSITE FACTOR} - \text{AVERAGE 1990 TRIP RATE}$$

$$\text{COMPOSITE FACTOR} = \frac{\text{1990 PERSON/VEH.}}{\text{2020 PERSON/VEH.}} \times \text{USAGE FACTOR} \times \text{AVERAGE 1990 TRIP RATE}$$

$$\text{COMPOSITE FACTOR} = \frac{1.15}{1.00} \times 0.95 \times \frac{2.30}{2.50} = 1.0051$$

INCREASE FOR GENERATION RATES = (7.07 x 1.0051) - 7.07 = 0.036

The trip generation rates for the 2020 were not increased.

Comparison With the Base Year

Table A-9 is a comparison of trips produced in the base year (1990) with trips produced in the design year (2020).

TABLE A-9

TRAVEL DATA SUMMARY		
Type	1990	2020
Average Daily Trips per DU	7.07	7.78
Internal Trips	56,218	94,296
Home Based Work	14,055	23,574
Other Home Based	29,796	49,977
Non-Home Based, internal	12,368	20,754
NHB secondary	24,476	48,980
Internal <-> External	63,972	120,752
Through Trips	77,044	158,872

Design year trip attraction factors for OHB and NHB purposes were determined by using the 1990 regression equation with projected 2020 zonal employment and dwelling unit data. Trip attraction factors for HBW trips were taken as the total projected zonal employment for the design year. The distribution of 2020 employment, as shown in Table A-5, was based on expected land use development as determined by the local officials. Design year internal and external-internal trips were again distributed by the gravity model.

TABLE A-10

Friction Factors
Smithfield, Selma and Pine Level Area

Time Interval	HBW	OHB	NHB	EXT-INT
1	23292	62109	43301	200894
2	32862	52786	50465	96961
3	31709	36721	36972	52673
4	22713	21814	19186	31460
5	13109	11544	7946	20179
6	6618	5677	2959	13578
7	3171	2707	1116	9362
8	1566	1306	481	6461
9	865	665	266	4359
10	580	373	214	2809
11	513	240	281	1689

TABLE A-11

Trip Length Frequency Distribution Curve
Smithfield, Selma and Pine Level Area

Time Interval	HBW	OHB	NHB	EXT-INT
1	0.00	0.00	0.00	4.10
2	20.77	28.74	30.00	9.80
3	23.89	24.42	34.50	7.60
4	21.34	18.22	20.20	6.80
5	16.05	12.59	9.70	8.60
6	10.39	7.82	3.80	17.60
7	5.48	4.29	1.30	13.90
8	1.80	2.30	0.50	12.70
9	0.28	1.24	0.00	8.90
10	0.00	0.38	0.00	7.10
11	0.00	0.00	0.00	2.90
	100.00	100.00	100.00	100.00

APPENDIX B

GOALS & OBJECTIVES SURVEY DATA SUMMARY FOR SMITHFIELD, SELMA and PINE LEVEL

SURVEY FORM:

A two page survey was distributed to travellers in the planning area to determine local desires and priorities in the thoroughfare plan. The survey form was organized as follows:

Page 1: Twenty issues were scored from very undesirable(-2) to very desirable(+2) in the categories of Environment, Neighborhood, Economic, and Transportation.

Page 2: Five issues in each of five categories were ranked in order of importance (from 1-5, 1 being most important).

SUMMARY PROCEDURE:

The scores for each issue on page 1 were combined from all surveys to get totals (subtract negatives, add positives). These values were used in bar graph defining the priority of each issue.

For page 2, the number of times each issue received a #1 ranking was determined. These numbers were used in a bar graph to demonstrate which issues were most frequently ranked first.

CONCLUSIONS:

Responses recorded on page 1 of the survey indicate a strong desire for preserving the neighborhood/community, maintaining easy access to downtown, and avoiding urbanization and strip development.

On page 2 the highest frequency of #1 rankings occurred in issues stating the desire to attract new industry and to stimulate new economic development growth.

GOALS & OBJECTIVES SURVEY
SMITHFIELD, SELMA, PINE LEVEL, N.C.

Circle the number to indicate how desirable the following items are to you.

Very Undesirable ---	-2
Undesirable --------	-1
Neutral ----------	N
Desirable ----------	+1
Very Desirable -----	+2

ENVIRONMENTAL ISSUES:

1) Minimize air pollution from vehicles:	-2	-1	N	+1	+2
2) Minimize traffic noise in neighborhoods:	-2	-1	N	+1	+2
3) Minimize traffic noise in business areas:	-2	-1	N	+1	+2
4) Urbanize all undeveloped land:	-2	-1	N	+1	+2
5) Protect natural areas as buffer zones:	-2	-1	N	+1	+2

NEIGHBORHOOD ISSUES:

1) Preserve historic property:	-2	-1	N	+1	+2
2) Protect neighborhoods from truck traffic:	-2	-1	N	+1	+2
3) Landscape streets with trees and shrubs:	-2	-1	N	+1	+2
4) Invite long sections of urban strip development:	-2	-1	N	+1	+2
5) Preserve community character:	-2	-1	N	+1	+2

ECONOMIC ISSUES:

1) Minimize road construction costs:	-2	-1	N	+1	+2
2) Minimize travel time and cost:	-2	-1	N	+1	+2
3) Access downtown from I-95	-2	-1	N	+1	+2
4) Access downtown from US 70 interchange:	-2	-1	N	+1	+2
5) Increase the local population:	-2	-1	N	+1	+2

TRANSPORTATION ISSUES:

1) Have frequent traffic signals on major roads:	-2	-1	N	+1	+2
2) Increase traffic safety:	-2	-1	N	+1	+2
3) Provide bicycle paths to schools and parks:	-2	-1	N	+1	+2
4) Provide vans to shopping areas and downtown to relieve some of the parking demand:	-2	-1	N	+1	+2
5) Provide sidewalks and scenic paths to encourage people to walk instead of drive:	-2	-1	N	+1	+2

GOALS & OBJECTIVES SURVEY
SMITHFIELD, SELMA, PINE LEVEL, N.C.

Please rank each group of items in order of importance.
(1 is the most important, 5 is the least important)

RANK HOW ROAD CAPACITY SHOULD BE INCREASED:

_____ By improving the geometric design of intersections:
_____ By constructing additional traffic lanes:
_____ By controlling strip development and promoting campus developments:
_____ By encouraging people to ride together or ride public transportation:
_____ By providing alternative modes of travel such as pedestrian paths or bicycle trails:

RANK WHY ROADS SHOULD BE PLANNED:

_____ To urbanize the rural land outside the town limits:
_____ To increase the tax base:
_____ To control growth:
_____ To revitalize the existing developed areas (such as renovating historic buildings):
_____ To provide citizens knowledge of public intent:

RANK THE LOCAL ISSUES:

_____ Minimize road widening and construction costs:
_____ Minimize travel time from I-95 to downtown:
_____ Minimize travel time from the new US 70 bypass to downtown:
_____ Minimize the environmental impacts of building new roads:
_____ Attract new industry:

RANK THE ISSUES IN DEVELOPING A THOROUGHFARE PLAN:

_____ Environmental preservation:
_____ Individual home or business preservation:
_____ Community preservation:
_____ New economic development growth:
_____ Community enhancements (such as better roads, quieter neighborhoods, pedestrian trails...):

RANK LOCAL PROJECT NEEDS:

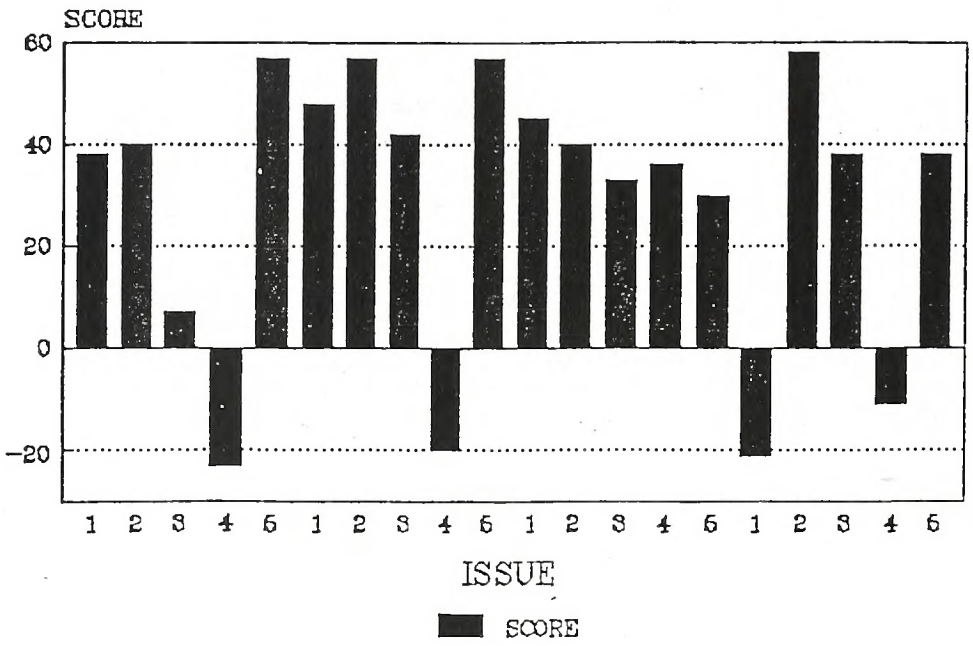
_____ Railroad crossing over Market Street in Smithfield:
_____ Right-of-way acquisition for the proposed loop systems:
_____ Hospital Road and Second Street intersection:
_____ Widening of US 70-A through Pine Level:
_____ Widening of US 301 from Anderson Street to NC 39 in Selma:

COMMENTS:

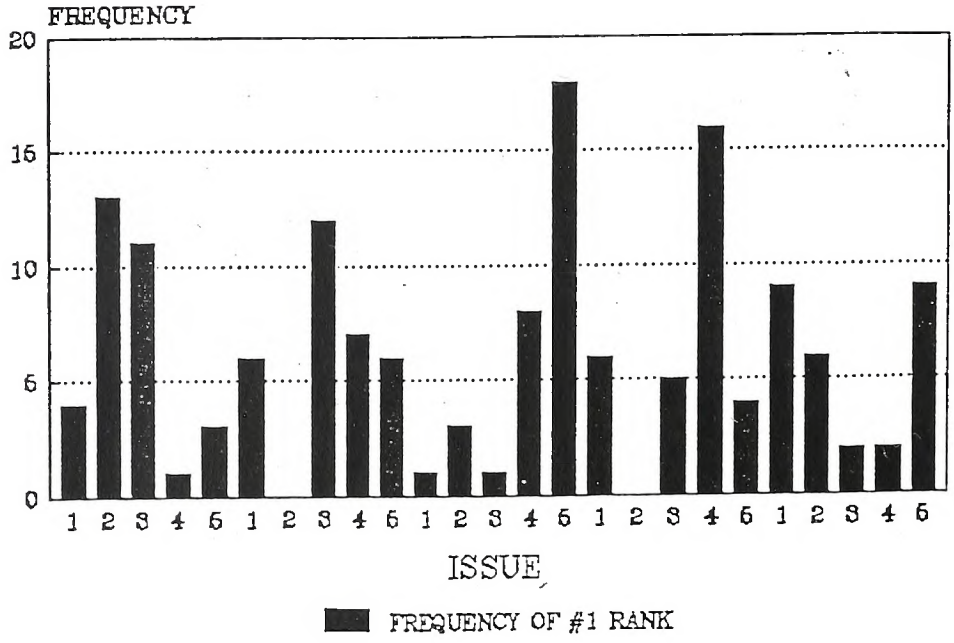
ISSUE	SCORE
ENVIRONMENTAL	
1) Minimize air pollution	38
2) Minimize traffic noise in neiborhood	40
3) Minimize traffic noise in business area	7
4) Urbanize all undeveloped land	-23
5) protect natural areas	57
NEIGHBORHOOD	
1) Preserve historic property	48
2) Protect neighborhoods from truck traffic	57
3) Landscape streets with trees and shrubs	42
4) Invite long sections of urban streep development	-20
5) Preserve community character	57
ECONOMIC	
1) Minimize road construction costs	45
2) Minimize travel time and cost	40
3) Access downtown from I-95	33
4) Access downtown from US 70 interchange	36
5) Increase the local population	30
TRANSPORTATION	
1) Frequent traffic signals on major roads	-21
2) Increase traffic safety	58
3) Provide bicycle paths to schools and parks	38
4) Provide vans to shopping areas and downtown	-11
5) Provide sidewalks and scenic paths	38

ISSUE/METHOD	FREQUENCY OF #1 RANKINGS
HOW ROAD CAPACITY SHOULD BE INCREASED	
1) Improve the geometric design of intersections:	4
2) Construct additional traffic lanes:	13
3) Control strip development:	11
4) Encourage ride-sharing:	1
5) Provide alternative travel modes:	3
WHY ROADS SHOULD BE PLANNED	
1) Urbanize rural land	6
2) Increase tax base:	0
3) Control growth:	12
4) Revitalize existing developed areas:	7
5) Provide citizens knowledge of public intent:	6
LOCAL ISSUES	
1) Minimize road widening and construction costs:	1
2) Minimize travel time from I-95 to downtown:	3
3) Minimize travel time from the US 70 bypass to downtown:	1
4) Minimize the environmental impacts:	8
5) Attract new industry:	18
ISSUES IN DEVELOPING A THOROUGHFARE PLAN	
1) Environmental preservation:	6
2) Individual home or business preservation:	0
3) Community preservation:	5
4) New economic development growth:	16
5) Community enhancements:	4
LOCAL PROJECT NEEDS	
1) Railroad crossing over Market Street in Smithfield:	9
2) Right-of-way acquisition for the proposed loop systems:	6
3) Hospital Road and Second Street intersection:	2
4) Widening of US 70-A through Pine Level:	2
5) Widening of US 301 from Anderson St. to NC 39:	9

SURVEY PAGE 1



SURVEY PAGE 2



APPENDIX C

RECOMMENDED SUBDIVISION ORDINANCES

Definitions

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intrastate and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate and other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares collect traffic from local access streets and carry it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through-traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved; (3) widening of open streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right of way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within Smithfield, Selma and Pine Level Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the Town of Smithfield, Town of Selma, Town of Pine Level and the North Carolina Department of Transportation.

The proposed street layout shall be coordinated with the

existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted Smithfield, Selma and Pine Level Thoroughfare Plans.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

	Minimum ROW
1. Rural	
a. Principle Arterial	
Freeways	350 ft.
Other	200 ft.
b. Minor Arterial	100 ft.
c. Major Collector	100 ft.
d. Minor Collector	80 ft.
e. Local Road	* 60 ft.
2. Urban	
a. Major Thoroughfare other than Freeway and Expressway	90 ft.
b. Minor Thoroughfare	70 ft.
c. Local Street	* 60 ft.
d. Cul-de-sac	** Variable

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that

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* The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

** The ROW dimension will depend on radius used for vehicular turn-around. Distance from edge of pavement of turn-around to ROW should not be less than distance from edge of pavement to ROW on street approaching turnaround.

subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than sixty feet in width may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths: Width for street and road classifications other than local shall be as required by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential

Curb and Gutter section: 26 feet, face to face of curb
Shoulder section: 20 feet to edge of pavement, 4 foot shoulders

2. Residential Collector

Curb and Gutter section: 34 feet, face to face of curb
Shoulder section: 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets shall be:

DESIGN SPEEDS				
Facility Type	Desirable Speed	---- Minimum Speed ---- Level	Rolling	Mountainous
Rural				
Minor Collector Roads	60	50	40	30
Local roads, including Residential Collectors and Local Residential	50	* 50	* 40	* 30
Urban				
Major Thoroughfares, other than Freeway, Expressway, or Parkway	60	50	50	50
Minor Thoroughfares	60	50	40	40
Local Streets	40	** 40	** 30	** 30

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* Based on projected annual average daily traffic of 400-750. In cases where road will serve a limited area and small number of dwelling units, minimum design speeds can be reduced further.

** Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE			
	---- Terrain ----		
Design Speed	Level	Rolling	Mountainous
60	4	5	6
50	5	6	7
40	6	7	8
30		9	10
20			12

b. A minimum grade for curbed streets should not be less than 0.5%.

c. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long may be 50% greater than the value in the above table.

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE				
Design Speed, MPH	30	40	50	60
Stopping Sight Distance:				
Minimum (ft.)	200	275	400	525
Desirable Minimum (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	80	160	310
Sag Curve	40	70	110	160
Passing Sight Distance:				
Minimum Passing Distance for 2 lanes, in feet	1,035	1,460	1,915	2,380

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1984".

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of

the vertical curve which will provide the desired sight distance.

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE

Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,528	3 45′
30	0.06	273	21 00′
40	0.06	509	11 15′
50	0.06	849	6 45
60	0.06	1,380	4 15′
30	0.08	252	22 45′
40	0.08	468	12 15′
50	0.08	764	7 30′
60	0.08	1,206	4 45′

* e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections which cannot be aligned should be

separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than five hundred (500) feet in length. The distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turnaround. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the dead-end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheelchair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of

pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways, publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons."

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

   a. Shoulder section approach

      i. Under 800 ADT design year:

         Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

      ii. 800 - 2000 ADT design year:

         Minimum 34 feet width face to face of parapets of rails or pavement width plus 12 feet, whichever is greater.

      iii. Over 2000 ADT design year:

         Minimum width of 40 feet, desirable width of 44 feet width face to face of parapets of rails.

   b. Curb and gutter approach

      i. Under 800 ADT design year:

         Minimum 24 feet face to face of curbs.

      ii. Over 800 ADT design year:

         Width of approach pavement measured face to face of curbs.

   Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-

way traffic should be as follows:

a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 8′ minimum, 10′ desirable.)

b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.

APPENDIX D

STREET TABULATION

The Street Tabulation consists of major and minor thoroughfares with base year and future year traffic volumes, and the recommended cross section for each road.

Definitions

DIST MI:	Section length in miles
RDWY FT:	Roadway width in feet
ROW FT:	Right-of-Way in feet
Capacity:	Capacity at Level of Service D
2020 ADT:	Avarage Daily Traffic (2020) on Thoroughfare Plan system
ADQ:	Adequate

APPENDIX D

TABLE D-1 THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1990 ADT	2020 ADT	RECOMMENDED CROSS SECTION RDWY (ULT)	ROW (ULT)
I-95								
South PAB - NC 96	0.50	48	270	54,000	28,732	53,900	ADQ	ADQ
NC 96 - US 70-B	5.05	48	260	54,000	27,190	55,100	ADQ	ADQ
US 70-B - US 70-A	2.09	48	260	54,000	27,190	55,303	ADQ	ADQ
US 70-A - North PAB	4.54	48	260	54,000	32,000	54,500	ADQ	ADQ
US 70-B								
West PAB - SR 1969	3.06	48	150	41,000	10,600	22,500	ADQ	ADQ
SR 1969 - NC 210	1.40	48	130	41,000	13,820	24,500	ADQ	ADQ
NC 210 - First St.	0.56	48	60	41,000	21,000	29,900	ADQ	ADQ
First St. - US 301	0.63	56	60	22,000	15,300	19,320	ADQ	ADQ
US 301 - ECL Smithfield	0.68	36	60	13,000	14,400	18,000	H	ADQ
ECL Smithfield - I-95	0.40	40	90	14,000	14,400	18,000	H	ADQ
I-95 - SR 2301	0.60	40	100	14,000	14,400	15,000	H	ADQ
SR 2301 - US 70	2.50	22	100	11,000	12,000	13,000	H	ADQ
US 70								
West PAB - SR 1913	2.38	48	210	50,000	12,700	33,776	ADQ	ADQ
SR 1913 - SR 1003	2.72	48	200	50,000	14,950	29,180	ADQ	ADQ
SR 1003 - US 301	0.32	48	150	50,000	14,950	27,470	ADQ	ADQ
US 301 - I-95	0.68	48	150	50,000	18,400	24,390	ADQ	ADQ
I-95 - US 70B	2.73	48	250	50,000	12,000	20,000	ADQ	ADQ
US 70B - East PAB	2.30	48	180	50,000	17,400	31,345	ADQ	ADQ
Programmed US 70 Flyover								
US 70 - US 70-B	2.62	48	200	(50,000)		14,000	ADQ	ADQ
US 70-A								
I-95 - Fitzgerald St.	2.09	24	60	12,000	5,650	9,500	ADQ	ADQ
Fitzgerald St. - SR 2309	0.17	52	60	14,000	5,000	9,500	ADQ	ADQ
SR 2309 - East PAB	1.70	24	60	12,000	2.690	8,200	ADQ	ADQ
US 301								
South PAB - US 701	0.68	32	60	13,000	3,900	9,000	ADQ	ADQ
US 701 - SR 1345	0.90	32	60	13,000	7,300	24,000	D	ADQ
SR 1345 - SR 1007	2.90	24	60	12,000	11,500	22,800	D	ADQ
SR 1007 - US 70-B	0.91	55	60	22,000	10,500	14,400	ADQ	ADQ
US 70-B - Bridge St.	0.11	55	60	22,000	13,000	18,090	ADQ	ADQ
Bridge St. - North St.	0.26	59	80	22,000	13,000	22,800	ADQ	ADQ
North St. - US 70-A	2.18	59	80	22,000	16,400	23,600	ADQ	ADQ
US 70-A - SR 1927	1.19	64	80	22,000	10,900	17,800	ADQ	ADQ
SR 1927 - Pelham St.	0.43	36	60	13,000	9,400	17,800	D	ADQ
Pelham St. - NCL Selma	0.39	24	60	12,000	12,560	17,800	D	ADQ
NCL Selma - NC 39	0.40	24	60	12,000	7,500	16,000	D	ADQ
NC 39 - North PAB	3.80	24	60	12,000	3,000	10,800	ADQ	ADQ
Proposed US 301 Bypass								
US 301 - NC 96	1.25			12,000		7,500	L	100
NC 96 - SR 1003	1.13			12,000		7,300	L	100
SR 1003 - SR 1914	1.36			12,000		7,000	L	100
SR 1914 - US 70	0.62			12,000		8,500	L	100
US 70 - SR 1913	0.90			12,000		8,000	L	100
SR 1913 - US 70-B	2.27			12,000		8,500	L	100
US 70-B - NC 210	1.36			12,000		6,000	L	100

APPENDIX D

TABLE D-1 THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1990 ADT	2020 ADT	RECOMMENDED CROSS SECTION RDWY (ULT)	ROW (ULT)
NC 39								
North PAB - US 301	3.00	20	60	10,500	1,400	3,800	(L)	ADQ
NC 96								
North PAB - Richardson St.	3.80	24	60	12,000	2,800	6,000	ADQ	ADQ
NC 210								
West PAB - SR 1010	1.81	22	60	11,000	3,800	9,000	L	ADQ
SR 1010 - US 70	1.70	22	60	11,000	6,200	10,200	L	ADQ
NC 701								
South PAB - US 301	0.80	24	100	12,000	3,800	8,000	ADQ	ADQ
SR 1001 (Lizzie Mill Rd.)								
East PAB - ECL Selma	3.86	20	60	10,500	1,400	3,100	(L)	ADQ
ECL Selma - Pollack St.	0.70	36	60	13,000	1,040	4,400	ADQ	ADQ
SR 1003 (Buffaloe Rd.)								
North St. - Hospital Rd.	0.22	24	60	12,000	3,000	6,800	ADQ	ADQ
Hospital Rd. - SR 1923	1.02	24	60	12,000	2,740	6,500	ADQ	ADQ
SR 1923 - US 70	1.76	18	60	9,000	2,740	6,500	(L)	ADQ
US 70 - SR 1934	1.30	20	60	10,500	2,800	7,900	(L)	ADQ
SR 1934 - North PAB	1.76	20	60	10,500	2,340	4,900	(L)	ADQ
SR 1007 (Brogdan Rd.)								
South PAB - I-95	4.43	20	60	10,500	2,400	5,250	(L)	ADQ
I-95 - Old Depot Rd.	0.10	22	60	11,500	5,800	9,000	(L)	ADQ
Old Depot Rd. - ECL Smithfield	0.24	22	60	11,500	4,200	8,500	(L)	ADQ
ECL Smithfield - US 301	0.30	44	60	15,000	4,200	8,500	ADQ	ADQ
SR 1010 (Cleaveland Rd.)								
West PAB - NC 210	1.60	24	60	12,500	2,630	5,780	ADQ	ADQ
SR 1341 (Rand Rd.)								
NC 210 - US 301	2.91	22	60	11,500	2,200	8,200	(L)	ADQ
SR 1900 (Noble St.)								
SR 1003 - Bervard St.	1.10	20	60	9,500	4,100	6,100	(K)	ADQ
Bervard St. - Web St.	0.50	32	60	13,000	3,200	5,200	(K)	ADQ
SR 1913 (Poplar Rd.)								
US 70 - SR 1918	2.48	24	60	12,000	1,800	3,800	ADQ	ADQ
SR 1918 - US 70-B	1.40	24	60	12,000	8,700	11,500	ADQ	ADQ
SR 1921 (Hospital Rd.)								
US 301 - Buffaloe Rd.	0.66	22	60	11,000	3,000	7,700	(K)	ADQ
Buffaloe Rd.- Second St.	0.15	22	60	11,000	3,000	7,700	(K)	ADQ

APPENDIX D

TABLE D-1 THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1990 ADT	2020 ADT	RECOMMENDED CROSS SECTION RDWY (ULT)	ROW (ULT)
SR 1923 (Booker Dairy Rd.)								
US 301 - SR 1003	1.67	20	60	10,500	3,700	10,300	(I)	ADQ
Booker Dairy Extention								
SR 1003 - SR 1913	1.36			(20,000)		10,700	I	60
SR 1913 - US 70	0.85			(20,000)		12,000	I	60
Booker Dairy Extention								
US 301 - Peeden Road	0.54			(12,000)		6,300	L	60
SR 1927								
SR 2309 - Fitzgerald Ct.	0.16	18	60	9,000	3,100	6,800	(L)	ADQ
Fitzgerald Ct. - Holt St.	0.14	24	60	12,000	3,100	6,800	ADQ	ADQ
Holt St. - SR 2387	1.35	18	60	9,000	3,100	6,800	(L)	ADQ
SR 2387 - SCL Rail Road	0.90	28	60	12,000	3,100	6,800	ADQ	ADQ
SCL Rail Road - US 301	0.39	36	60	13,000	3,100	6,800	ADQ	ADQ
US 301 - SR 1928	0.80	36	60	13,000	3,100	6,800	ADQ	ADQ
SR 1928 (River Rd.)								
SR 1003 - Primose St.	0.90	18	60	9,000	700	1,800	(L)	ADQ
Primose St. - Oak St.	0.20	18	60	9,000	700	1,800	(L)	ADQ
SR 1929 (Oak Street)								
US 70 - SR 1003	1.00	24	60	12,000	690	2,100	ADQ	ADQ
SR 1003 - SR 1928	0.95	18	60	9,000	690	2,100	(K)	ADQ
SR 1928 - SCL Rail Road	1.00	18	60	9,000	690	2,100	(K)	ADQ
Oak St. Extention								
SCL Rail Road - SR 1927	0.17			(12,000)		3,000	K	60
SR 2302 (Ricks Road)								
US 301 - US 70	0.60	24	60	12,000	6,600	9,800	ADQ	ADQ
SR 2305								
SR 1927 - US 70-B	2.60	20	60	10,500	400	1,700	(L)	ADQ
SR 2309 (Peedin Avenue)								
SR 1001 - SR 1927	2.25	22	60	11,000	1,000	2,500	(L)	ADQ
SR 1927 - Blanche St.	0.17	30	60	13,000	1,700	3,600	ADQ	ADQ
Blanche St. - US 70-A	0.10	26	60	12,000	1,700	3,600	ADQ	ADQ
US 70-A - South PAB	3.00	20	60	10,500	600	1,089	(L)	ADQ
SR 2310 (Davis Mill Rd.)								
US 70 - US 70-A	1.87	18	60	9,000	500	1,140	(L)	ADQ
US 70-A - Blanche St.	0.10	18	60	9,000	500	1,140	(L)	ADQ
SR 2332 (Web St.)								
US 301 - Floyd St.	1.20	20	60	10,500	700	1,500	(L)	ADQ
Floyd St. - Pelham St.	0.10	37	60	13,000	1,730	1,500	ADQ	ADQ

APPENDIX D

TABLE D-1 THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1990 ADT	2020 ADT	RECOMMENDED CROSS SECTION RDWY (ULT)	ROW (ULT)
SR 2374 (Blanche Street)								
SR 2305 - WCL Pine Level	1.37	20	60	10,500	600	1,300	(L)	ADQ
WCL Pine Level - Peedin Avenue	0.29	18	60	9,000	600	1,560	(L)	ADQ
Peedin Ave. - US 70-A	0.12	18	60	9,000	600	3,380	(L)	ADQ
SR 2375								
US 70-B - US 70	1.50	20	60	10,500	400	1,185	(L)	ADQ
SR 2380								
Anderson St. - SR 1001	1.02					1,200	L	60
SR 2383 (Preston St.)								
SR 2393 - SCL Rail Road	0.50	18	60	9,000	580	1,300	(L)	ADQ
SCL Rail Road - Pollack	0.20	40	60	15,000	580	1,300	ADQ	ADQ
SR 2398 (Industrial Park Road)								
US 70-B - US 70	2.15	24	60	12,000	5,800	11,800	ADQ	ADQ
SR 2500								
SR 2548 - US 301	0.20	24	60	12,000	2,000	3,970	ADQ	ADQ
SR 2502 (Old Depot Rd.)								
Brogden Rd. - SR 2560	0.80	22	60	11,000	3,000	6,600	(L)	ADQ
SR 2548								
SR 2500 - Brogden Rd.	1.10	24	60	12,000	2,000	3,970	ADQ	ADQ
SR 2560 (Johnston Tech Rd.)								
SR 2502 - US 70	0.80	24	60	12,000	3,000	6,600	ADQ	ADQ
Berkshire Rd.								
Hospital Rd. - Canterbury Rd.	0.56	36	60	13,000	2,000	4,400	ADQ	ADQ
Canterbury Rd.								
US 301 - Runnymede Pl.	0.40	36	50	13,000	900	2,100	ADQ	ADQ
Runnymede Pl.-Parkway Dr.						2,100	K	60
Crestwood Church Rd.								
SR 1003 - SR 1923	0.86					7,400	L	60
Eason Lane								
SR 1907 - Jones St. Extention	0.51					2,000	K	60
Forest Street								
Anderson St. - Oak St.	0.14	18	60	9,000	600	1,300	(L)	ADQ

TABLE D-1 THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1990 ADT	2020 ADT	RECOMMENDED CROSS SECTION RDWY (ULT)	ROW (ULT)
Jones Avenue								
US 301 - Dogwood Dr.	0.50	28	60	12,000	1,300	3,185	ADQ	ADQ
Dogwood Dr. - West St.	0.20					3,185	L	60
West St. - Eason Lane	0.45					3,185	L	60
Eason Lane - Crestwood Church Rd.	1.00					3,185	L	60
Peedin Road								
US 301 - SR 2398	1.02	20	60	10,500	1,500	2,980	ADQ	ADQ
Second Street								
Hospital Rd. - North St.	0.12	28	60	12,000	1,000	2,100	ADQ	ADQ
North St. - US 70-B	0.36	28	60	12,000	1,000	2,100	ADQ	ADQ
US 70-B - Church St.	0.19	39	80	14,000	4,400	8,000	ADQ	ADQ
Church St. - Rose St.	0.33	24	50	12,000	3,480	6,600	ADQ	ADQ
Rose St. - Wellons St.	0.39	32	50	13,000	3,480	6,600	ADQ	ADQ
Wellons St. - Wilson St.	0.57	30	50	13,000	3,480	6,600	ADQ	ADQ
Third Street								
North St. - Bridge St.	0.28	26	60	12,000	5,000	9,900	ADQ	ADQ
Bridge St. - Johnson St.	0.20	36	60	14,000	5,000	9,900	ADQ	ADQ
Johnson St. - US 301	0.80	30	60	13,000	5,000	9,900	ADQ	ADQ
West Street								
Noble St. - Peedin St.	0.40	24	60	12,000	300	1,000	ADQ	ADQ
Peedin St. - Pollock St.	0.50					5,000	L	60

Typical Thoroughfare Cross Section Explanations

Design requirements for thoroughfares vary according to the desired capacity and level of services to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its design requirements determind on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Cross section "A" is typical for controlled access freeways. The 46 foot grassed median is the minimum median width. Wider variations could result depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas that may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and **cross section "D"**, five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical **cross section "H"** is recommended for major thoroughfares where projected travel indicates a need for four travel lanes, but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require **cross section "I"**.

Cross sections "J" and "K" are recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares where parking on both sides is needed as a result of more concentrated development.

Cross section "L" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter cross sections all illustrate the sidewalk next to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

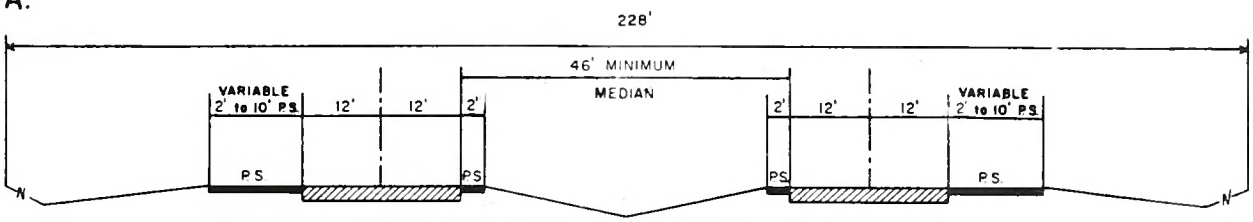
Rights-of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle traffic along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to allow for the bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for bicycle facility design standards.

Recommended typical cross sections for thoroughfares were derived using projected traffic, existing capacities, desirable levels of service, and available right-of-way.

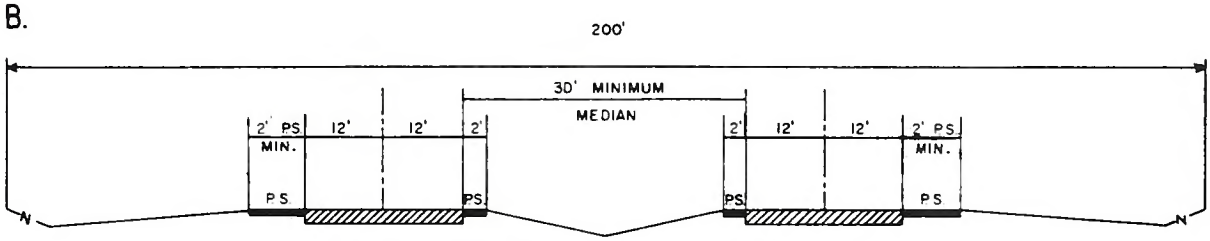
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



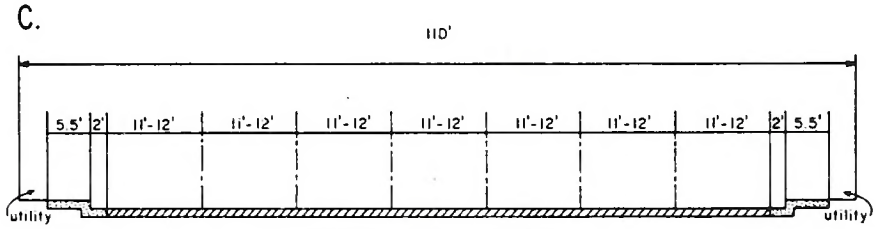
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



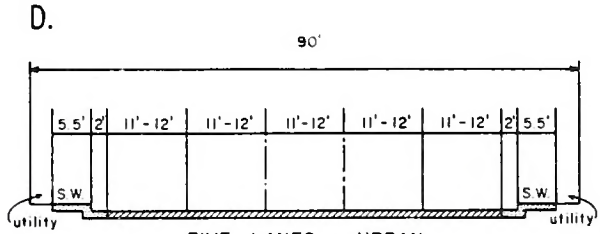
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



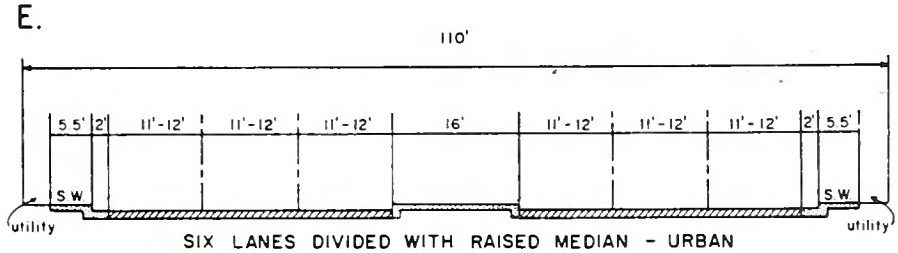
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

E.

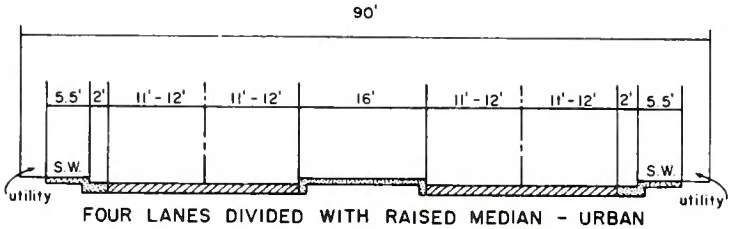


SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

FIGURE D-1

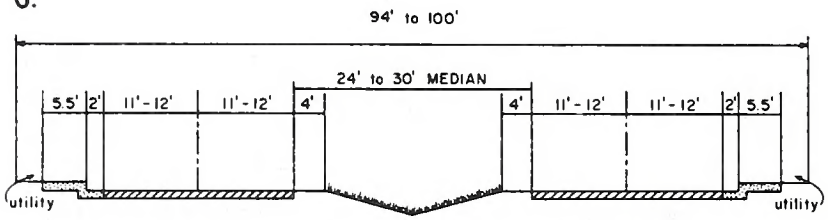
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



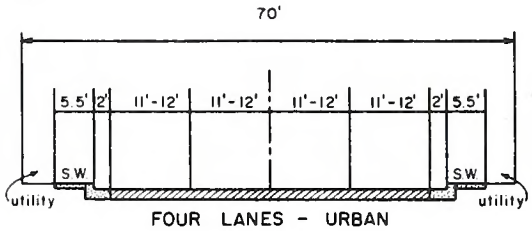
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



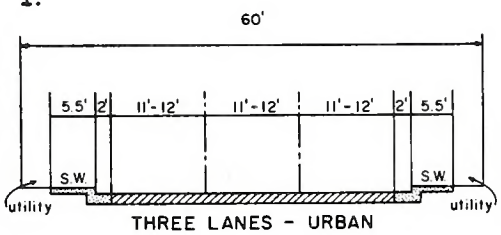
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



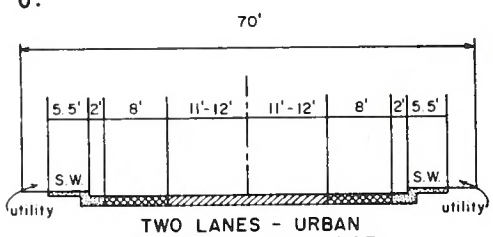
FOUR LANES - URBAN

I.



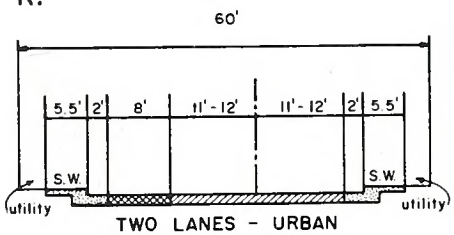
THREE LANES - URBAN

J.



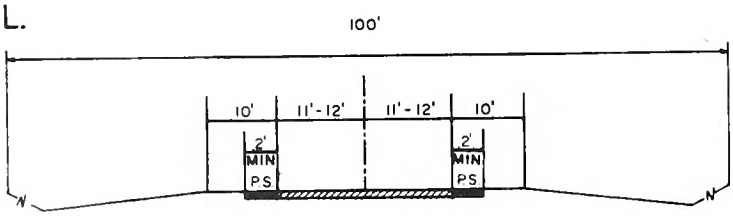
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



TWO LANES - RURAL

APPENDIX E

US 70 Bypass of Smithfield

R - 84 Johnston County

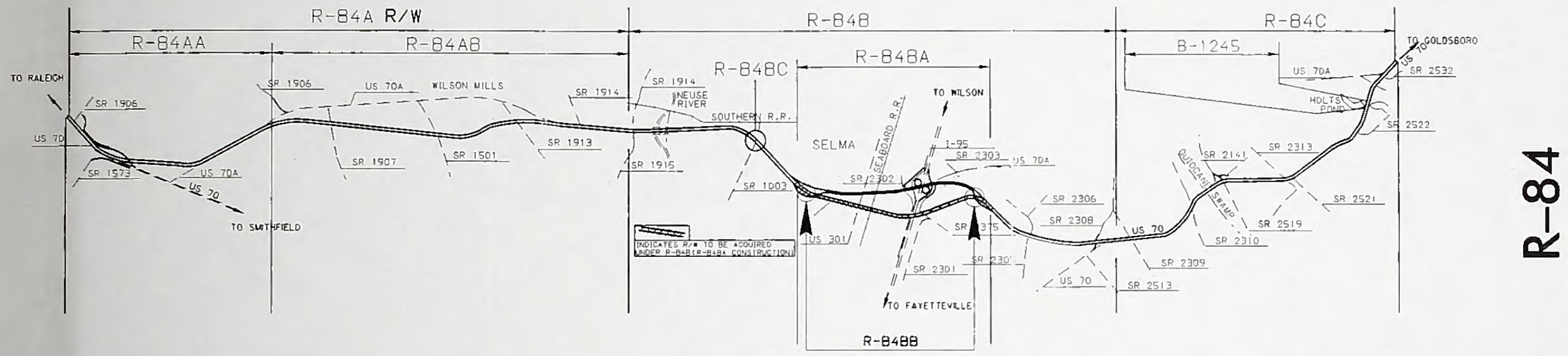
Figure E-1 is the Project Breakdown Map for the US 70 Bypass of Smithfield.

R-84 JOHNSTON COUNTY

US-70 (SMITHFIELD BYPASS)

PROJECT BREAKDOWN MAP

		COMPLETE	COMPLETE	COMPLETE	
I.D.NO./D.S.R.NO.	R-84A	R-84AA	R-84B	R-84B	R-84BA
STATE PROJECT NO. (P.E.)	B.1236901	B.1236901	B.1236901	B.1236901	B.1236901
PROJECT ENGINEER	LASSITER/GIROLAMI	LASSITER	LASSITER	LASSITER	LASSITER/GIROLAMI
PROJECT DESCRIPTION	US 70 SMITHFIELD BP FROM SR 1906 TO WEST OF SMITHFIELD TO SR 1915 WEST OF THE NEUSE RIVER.	US 70 SMITHFIELD BP FROM SR 1906 WEST OF SMITHFIELD TO 0.9 MILES WEST OF SR 1907.	US 70 SMITHFIELD BP FROM 0.9 MILES WEST OF SR 1907 TO SR 1915 WEST OF THE NEUSE RIVER.	US 70 SMITHFIELD BP FROM 1915 WEST OF THE NEUSE RIVER TO EXISTING US 70 EAST OF SR 2308 EAST OF SMITHFIELD.	US 70 SMITHFIELD BP FROM 0.4 MILES EAST OF SR 1003 TO US 70 0.1 MILES WEST OF SR 2305 EAST OF SMITHFIELD.
COUNTY / DIVISION	JOHNSTON / 4TH	JOHNSTON / 4TH	JOHNSTON / 4TH	JOHNSTON / 4TH	JOHNSTON / 4TH
LENGTH	6.237 MI.	2.138 MI.	4.063 MI.	6.873 MI.	3.30 MI.
TYPE OF CONTRACT		TURNKEY	TURNKEY	TURNKEY	TURNKEY
REMARKS	R/W COMP. 12-90	R/W 4 PARCELS ADDED R-84A - R/W FOR R-84AA & R-84AB.		INCLUDES R/W FOR R-84 BA	R/W INCUDED IN R-84 B
BEGIN R/W ACQUISITION (T.I.P.)	01-88			5-87	5-87
BEGIN R/W ACQUISITION		N/A		N/A	N/A
PROPOSED LETTING (T.I.P.)		11-21-89	1-15-91	9-23-88	10-94
PROPOSED LETTING (PRODUCTION)					10-94
EST.COMP.DATE (T.I.P.)		10-18-91	9-15-92	10-22-91	
ESTIMATED R/W COST	$ 3,775,000			$ 5,500,000	
ESTIMATED CONSTRUCTION COST		$ 5,276,169	$ 5,719,000	$ 16,536,000	$ 9,600,000



	COMPLETE	LET	COMPLETE
I.D.NO./D.S.R.NO.	R-84BB	R-84 BC	R-84C
STATE PROJECT NO. (P.E.)	B.1236901	6.319001T	B.1236901
PROJECT ENGINEER	LASSITER	J. D. COCHRAN/C|ROLAMI	LASSITER
PROJECT DESCRIPTION	BRIDGES OVER US 70 (SELMA BYPASS) AT 0.5 MILES EAST OF SR2309 AND 1.1 MILES EAST OF I-95	US70 - SR 1003 INTERCHANGE	US 70 SMITHFIELD BP FROM EXISTING US 70 EAST OF SR 2308 TO THE PRINCETON BYPASS
COUNTY / DIVISION	JOHNSTON / 4TH	JOHNSTON / 4TH	JOHNSTON / 4TH
LENGTH	0.30 MILES	0.5 MI.	5.568 MI.
TYPE OF CONTRACT	TURNKEY	TURNKEY	TURNKEY
REMARKS	FLYOVER BRIDGES ONLY		DUAL BRIDGES OVER HOLTS POND LET 10-85.
BEGIN R/W ACQUISITION (T.I.P.)	N/A	4-91	5-86
BEGIN R/W ACQUISITION	N/A	N/A	N/A
PROPOSED LETTING (T.I.P.)	4-17-90	4-21-92	2-21-89
EST.COMP.DATE (90 T.I.P.)	7-19-91	8-93	5-12-91
ESTIMATED R/W COST	—	$ 1,555,000	$ 608,000
ESTIMATED CONSTRUCTION COST	$ 1,671,929	$ 4,500,000	$ 6,260,000

NOTE . PROJECT SCHEDULES AND ESTIMATED COSTS ARE ACCURATE AS OF THE DATE SHOWN.
CONSULT THE APPROPRIATE DESIGN STATUS REPORT FOR CURRENT SCHEDULE AND COSTS.

R-84

FIGURE E-1

LAST UPDATE · 10/28/92